

EXPLORING MATERIAL RELATIONS IN THE AI ERA

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ABSTRACT

Recent evolutions in the accessibility and uptake of generative AI tools have already affected the way design and engineering are taught at university level. The exploration of AI related tools and technologies is increasingly part of formal design study and informal and peer learning. It is however important to place recent evolutions in a longer temporal context. Design activity and education have seen a progressive move away from “thing-based” methods and towards capability, service, experience, and systemic approaches; considering the wider context and impact of design interventions.

These evolutions in design and design education create a learning environment where the abstract, virtual and experiential are, in some cases, more present than the material and tangible. This paper proposes a discussion on the importance of addressing materiality and tangible everyday material experience in this evolving context. This paper presents two different “families” of teaching modules that have evolved over a period of five years with a focus on materiality, material relations and touch. While these two modules represent different ways of exploring materials and material relations, they together permit reflection around forms of tangible/material learning activities that may be relevant in future design curricula, and the criteria and qualities these forms of teaching may need to incorporate.

Keywords: Materiality, responsible design, transition, material relations, behaviour change

1 INTRODUCTION

Recent evolutions in the accessibility and uptake of generative AI tools have already affected the way design and engineering are taught at university level. This evolution can also be seen in a longer temporal context, with design activity and education progressively moving away from “thing-based” approaches and towards capability, service, experience and systemic approaches; considering the wider context and impact of design interventions. In this context exploring materiality and more specifically material relations as part of the future design curriculum might seem irrelevant, but these themes may be essential for environmentally meaningful education.

In the context of increasingly crowded design curricula, analysing the qualities and impacts of short, tested modules addressing materiality can be a useful entry point. The modules presented in this paper have been tested in a variety of design education contexts over a period of five years and have been progressively refined through a process of evolution and feedback [1].

Based on insights from these modules, our aim is to create a discussion around forms of material-oriented design education that may be important in a period of fundamental change.

2 EVOLUTIONS IN THE DESIGN CURRICULUM

At the start of the 21st century, Alain Findeli [2] wrote an important paper on how design education might operate a paradigm shift away from being “a branch of product development, marketing communication and technological fetishism”. Twelve years on, Jennifer Loy was already discussing how design students were finding the responsibility for the world’s environmental and social problems laid at their door [3]. Loy describes an extreme pace of change in product design education. Design programs may be becoming more abstract and theoretical in order to integrate necessary content around strategy, systems approaches and political issues. More recently the work of Ceschin & Gaziulusoy [4] highlights how design today must be increasingly systems-oriented for addressing environmental issues. In a special issue on Rethinking Design Education, Dubberley and Davis warn against resistance to the new

paradigm needed in design education. Designers must think in terms of systems, and no longer artifacts, information systems are the new material [5]

But while there is little doubt for the need for design education to continue to evolve in the directions highlighted above in order to address today's complex problems, systems level thinking may stop us from thinking about alternative eco-compatible behaviour. This potentially may distance us from our experience and perceived ability to act [6]. Designers need to become key advocates for environmental and social responsibility [7] with a grasp of sustainability fundamentals (circular economy; whole systems thinking; sustainable innovation strategies; impact assessment, laws and standards; communication, collaboration, and leadership...) But how to avoid a sense of disconnection? [8] Regeneration principles [9] involve notions of local, situated context and involvement/implication. Equally circular approaches necessitate tangible materials knowledge [1]. It is important that changes to the design curriculum do not turn "material considerations [into] the materiality of culture rather than the design implications of specification and the design opportunities provided by a material innovation." [3]

3 MATERIALITY IN DESIGN EDUCATION

Material knowledge is relevant for designing for circularity [1] and despite the danger of being labelled as the "old" curriculum [5], design education cannot simply reject materiality. Ignoring or avoiding material and stuff [10][11] is not a solution. Encouraging awareness of our material relations in the design curriculum can help to address not just knowledge deficit in environmental education, but also the behaviour deficit [9]. Approaches encouraging hands-on engagement with (and exploration of) materials may have the potential to decrease eco-complacency and avoid psychological distance and separation [9]. While the two short modules described below are relatively simple, they both match some of the requirements needed both for addressing materiality in design education and for more tangible forms of design for the environment.

3.1 Method

Revised versions of both modules involve reflective reports by students as part of the course deliverables (see below for details). In the case of the "mapping everything we touch exercise" the eleven reflective reports by the fifth-year master's students were analysed for the key learning points identified by the students themselves in personal reports submitted a week after the end of the workshop. For the second module, the "Netsuke workshop," the reflective reports submitted 5 days after the end of the workshop scoring 17/20 or more were analysed. Only the reports from the last two versions of the module were analysed for the purposes of this article, as the version of the year before included some activities which have been subsequently removed. An initial analysis of these reports provides the basis for the points that are discussed in relation to the two modules. These findings are complemented by analysis of emergent themes identified by teaching staff on these projects.

Table 1. Overview of the three versions of the "Mapping everything" exercise

| year | study level | student no. | context | duration (mapping) | next steps (using the everything maps as a start point) | | |
|------|-------------|-------------|---|--------------------|---|---|---|
| 2021 | year 4 | 23 | 2 week "speed project" on material relations | 2 days | focus on one issue (re-mapped) | themes used as trigger for quick ideation | 3 concept "transformations" of everyday things |
| 2023 | year 5 | 11 | 1-week intensive workshop on systems/giga mapping | 2 hours | pin-up & group discussion | choice of everyday material aberrations | Exploring systems mapping and related tools |
| 2024 | year 2 | 27 | 8-week project on the theme of sharing | 4 hours | pin-up, identify (non) eco-compatible behaviour. | mapping and discussing sharing issues | Project on new forms of sharing for meaningful environmental impact |

3.2 Mapping everything we touch

The book and research project by artist and ethnographer Paula Zucotti [12] has been an inspiration for a number of research projects and teaching modules [13]. Zucotti's protocol is a very effective way of exploring everyday material relations. Participants are asked to list everything they touch over a whole

day, and then this list is used as a basis for a visual mapping and discussion. It is a protocol that is sufficiently different and unexpected to make students want to carry out the activity, despite its' fastidious nature. The entry point for Zucotti is touch, which is valuable in the context of everyday material relations where a certain level of invisibility [14] may occur, particularly in longer object relations. Zucotti's protocol, adapted here, questions things-as-mediation and also encourages a form of active and engaged everyday auto-ethnography. Not so much a module as a module component, this protocol has proved a valuable entry point for different materials/behaviour related activities. Three different instances of this module component are discussed, and Table 1 gives an overview of these.

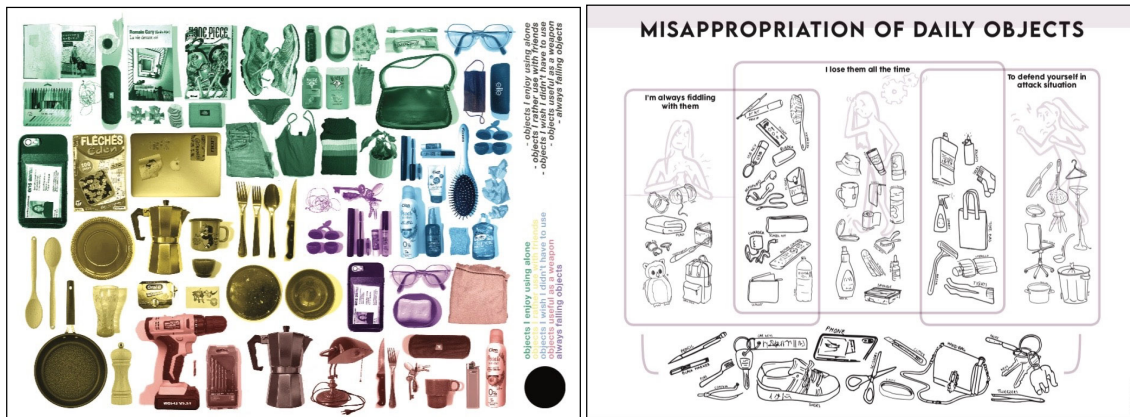


Figure 1. Everything mapping examples (Y4 students; I.DaSilva & L.Raimbault)

The common points in the three examples are using the protocol as an intensive activity at the start of a project or workshop, asking students to make a “map” of everything touched, and then asking them to consider different ways the represented objects could be grouped/reorganised. These groupings are then illustrated on the first map or in a new iteration of their map.

Figure 1 shows two examples of this second reorganised map by 4th year students in a slightly longer version of the exercise. Figure 2 shows a much quicker version of a reorganised map by a second-year student from the 2024 cohort. This first sorting exercise generates rich information around tangible/intangible qualities in material relations, encouraging thinking about the potential and complexity of everyday material objects, our relations with them, and the qualities that could be designed into them.

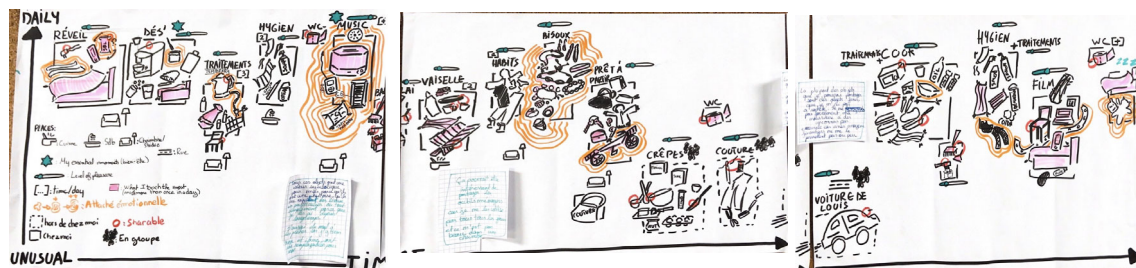


Figure 2. Everything mapping examples (Y2 student; A. Batoumeni)

The exercise also gives students an unexpected view on their own everyday behaviour. Students from 2024 commented “the amount of times I touch my phone throughout the day is embarrassing”, “how different my routine seems when I write it down”, “it’s concerning how little water I drink”.

While not all instances of using this module component have included written/text-based reports, a recent project involving 5th year masters’ students in Design for Social Innovation did include reflective reports. These reports have been analysed here to highlight the benefits of this exercise identified by students themselves. Seven main points emerge from these reports (student comments in italics):

- **Revealing and reflexive**, showing multiple levels in everyday object relations “*a kind of everyday hunt/investigation to understand the various relationships and systemic correlations of subjects that reveal social, economic, environmental, cultural, temporal and other contexts...*”
- **Concrete, tangible**, “*a concrete reflection on objects and our relationship with materials.*” “*for the first layer of the systemic map (it was nice to have a real context to rely on) ...*”
- **Unsustainable behaviour**, “*we have...the responsibility to observe how the world works*”, “*becoming aware of my relationship with objects helps me concretely to get out of many environmentally unsustainable mechanisms*”, “*raises the problem of overconsumption*” (But interestingly one student commented that [his] private context is not a “real” context for environmental questions.)
- **Surprise, unexpected**, [the] “*exercise surprised me because I had never realized how much I could relate to objects. Especially when I counted them, seventy-two seemed to me to be a huge figure.,*” “*that made me ask to myself some questions that we often take for granted.*”
- **Sensitive, sensorial, engages our bodies**, “*it allowed us to really engage the body and summon each of us into the reflexive process,*” “*we could express the sensitive and sensorial way of connections.*”
- **(Seeing/sharing) diversity of everyday experiences**, “*The perception is something very important in design because people do not have the same lives and experiences.*”
- **Detail**, “*noting every detail, no matter how minute, proved to be an interesting way of adding depth to the analysis and increasing the degree of representativeness.*”

Students also commented on how this exercise was a useful warm-up and first step towards systems thinking and mapping.

3.3 “Netsuke” workshop

A hands-on materials-oriented workshop module has been running in current form for the last six years for design students’ half-way through their first year of studies. The aim of this module is both discovering material properties through doing/interaction and encouraging students to discover other ways to stimulate and express their creativity. The content of these short workshops (three consecutive days of six hours) has been progressively refined. While previous workshops involved making simple wooden cutlery, or jewellery items, the last three years have taken “Netsuke” as their focus (exclusively and with more rewarding results for students in the last two years). The choice of the netsuke was in part inspired by the work of Edmund DeWaal [15], exploring the importance of things, even in objects of tiny scale, of detail and of the importance of tactile qualities.

Table 2. Overview of “Netsuke” workshops

| year | student no. | day one | day two | day three | completing activity | reports analysed |
|------|-------------|---|---|---|---------------------|------------------|
| 22 | 17 | creativity exercises using soft wax: pasta then netsuke brief | soft (modelling) wax > hard (carving) wax of netsuke concepts | carving hard wax > carving final wood version | 3 (2 in wood) | |
| 23 | 21 | 10 quick concepts in soft wax, 2/3 refined concepts in denser modelling wax | hard (carving) wax refined scale model of one netsuke | refined scale model of one netsuke in choice of timber (pear-wood, sycamore, lime, spruce...) | 18 in wood | 6 |
| 24 | 22 | 10 quick concepts in soft wax, 1/2 refined concepts in denser modelling wax | hard (carving) wax refined scale model of one netsuke | refined scale model of one netsuke in lime wood | 22 in wood | 7 |

(Netsuke are highly decorative and highly personal objects, roughly the size of a walnut and pierced to include a cord, that were traditionally used to fix personal items to the belt of the Kimono.) The size of the objects means that materials more commonly used for jewellery prototypes such as soft modelling wax and hard carving wax could be introduced to students, adding the discovery of different materials to the experience. In order to enable students to have a “real” object at the end of the short workshop, the final version of their netsuke is carved in wood. The last three versions of this workshop, with first year students in product and UX design, have all included reflective reports as part of the module

deliverables. The points discussed below are based on individual student reports from the last two years (see Table 2 for details), where a warm-up exercise (of modelling ideas for pasta) was dropped. This enabled the majority of the class to finish the assignment and produce a result that was satisfying for them. A small selection of work (of eight students from all three years) is shown in Figure 3. The student feedback on this workshop has been very positive, with comments confirming appreciation of doing a hands-on activity, and the value of discovering materials through interaction with them for material understanding.



These points echo observations by a number of researchers in the previous E&PDE conference, such as Soares et al. [9] and Ordonez et al. [1].

Figure 3. Netsuke in different materials (& different stages of the workshop)

Eight main insights emerging from the analysis of student reports are:

- **Learning**, students commented having the impression of learning a lot during the three days, and many different forms of learning are commented on; learning to work more precisely, working in steps, iterating, reflecting on the process, making mistakes and re-adapting, using constraints as opportunities, discovering a new way of working...
- **Time**, students realised that they needed to spend more time than they had anticipated, that they needed patience, and not to work with precipitation.
- **Rewarding**, students expressed pleasure on the workshop process and pride in their results (though a very small number of students did also comment that their final versions did not meet their expectations). In several cases the pride in the results was also linked to creating an object that they felt represented them. *“This netsuke really matches me; it regroups all the things I like.”*
- **Discovering materials**, students commented needing to adapt themselves to the constraints of each new material and compare the different materials and discovered how the final (natural) material was both more unpredictable, but also enabled them to get to a satisfying level of finish.
- **First time and learning new gestures**. Many students commented never having done this type of activity in the past, or never having sculpted materials as hard as the carving wax or wood. But comments also showed that the materials represented progressive difficulty, with students commenting that they realised they had already gained some skill in gestures that made working on subsequent versions quicker and easier.
- **Detail**, the scale of these objects meant that students had to think about detail, and also how each different material generates different constraints for detail.
- **Positive group dynamic**, there was a lot of helping between the students, and students discovered very different levels of skill and dexterity among their colleagues, *“we could be helped by others in the class who had more experience.”*
- **Hands, touch**, the largest number of comments concern touch, using their hands, and this activity was clearly unfamiliar for many of the students. Students realised that they needed to work on objects that were the right size to be held in the hand, and that were nice to hold with interesting textures. Comments also mention the first time “touching” certain materials, and being aware of how the heat of their hands initially changed the consistency of the wax too quickly.

4 DISCUSSION & CONCLUSION

While the two modules described here are of a very different nature from each other, there are a number of common points that can be identified. These aspects may constitute relevant aspects to be integrated into materials-oriented design teaching. These common points are: 1) unfamiliar activities/ material (students may today be unfamiliar with contact with materials in general), 2) hands on/learning by doing, 3) focus on touch, 4) looking at material qualities but also immaterial and symbolic qualities, 5) proximity 6) intensive/immersive activity, 7) engaged, implicating the body, human scale, 8) care, attention and detail, and finally 9) encouraging a reflective process (through mapping, sorting and making a project logbook).

While clearly design education needs to evolve rapidly in the face of the emergence of AI and of complex problems demanding more systemic approaches, it must also equip designers to address the current environmental crisis without generating disconnection. Materiality is an important aspect of environmental concerns; we can't ignore materials, their relation to our behaviour and to our bodies and our physical experience.

While the two modules here are not considered by the authors to be definitive, their common qualities may provide some workable guidelines for relevant forms of materials-based teaching. These may in turn be valuable as a way of balancing the design curriculum to avoid psychological distance and behaviour deficit in future designers.

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