Making as Pedagogical Practice in HCI: From Artefacts to Theory Building

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Abstract

This paper introduces the notion of making as a pedagogical practice in HCI education. Our focus is on generative design teaching in HCI that prioritizes collaborative engagements across a wide range of material encounters. We take the view that HCI education without a critical view of the relationship between people and objects results in abstract reasoning that runs the risk of an impoverished basis in praxis. To support this position, we provide a series of examples from our own teaching. Through these examples we locate our work in the field of new materiality and post-human design asking the question: How can HCI education account for the material turn? We observe that there is important theory-building work to be done in this area and propose some methods and a direction this work could take. HCI education remains dominated by an instrumentalist, problem-solving, evaluative approach. We suggest meaning making through material exploration can invigorate the discipline with a new design praxis.

Author Keywords

HCI; education; making; design; creative practice

CCS Concepts

•Social and professional topics → **Computing education; •Human-centered computing** → *Interaction design theory, concepts and paradigms;*

Introduction

This paper is based on teaching experiences and curriculum development in two programs in two different institutions: MA User Experience Design at London College of Communication (LCC), University of the Arts London and MS in Human Centered Design & Engineering in the department of Human Centred Design & Engineering at the University of Washington (UW). Whilst they have slightly different emphases, these two programs impose a practice-oriented view of interaction design, human centred design, and user experience design and are thus positioned in the field of practice-based education. The material turn in design theory has prompted us to consider the relationship to materials that we expect students to cultivate and that we elicit through learning activities. This seems to go hand-in-hand with a renewed interest in systems thinking within design education and the need for designers to articulate how they have conceptualised the materials they use throughout what Bratton [7] calls 'the stack' (2016). In other words, designers today act (albeit often unawares) at planetary scale, dependent on global flows of data and distributed processing power, which in turn brings about a new computational political order. As Morville [16] puts it "We think we're designing software, services, and experiences, but we're not. We are intervening in ecosystems."

The materials we use to perform these interventions are themselves deeply intertwingled [17]. We cannot separate a design prototyping software from the hardware on which it runs, nor the logic gates and electricity that allow it to function. This conception of design materials as constituting a system within which designers act, and through which designs come to realisation in the context of HCI education is the focus of this paper. We believe this work is necessary because the connection between HCI education and the new materialism remains both undertheorized in the design studio and underexplored in practice. The basis for a material turn in HCI education stems from the need for critical awareness of the relationship between people and computers that is configured by design. We acknowledge that this relationship is conditional on its social and technical situatedness, and contingent on a dynamic and unstable set of motivations and intentions. Lovelock [15] stresses that the linear nature of spoken and written language causes the human mind to make the error of valuing classical logic over what he calls intuitive logic. It is thus the embodied, spatial, tangible, and dimensional relationships with materials – what Ingold [14] calls 'correspondence' – that we seek to position as important to HCI education.

We give examples of student work throughout to illustrate our points. These are the results of studio briefs set for students at BA and MA/MS level at LCC and UW in 2019.

Background

HCI and Design have brought to the fore an emphasis on more-than-human-centered design theory and practice. There are a number of theoretical turns (nonhuman, posthuman, new materialist, object-oriented ontologies and philosophies) underlying this shift. HCI education still lags behind, however. These theoretical turns of a more-than-human-centered design must be incorporated into not just the theoretical work of researchers, but ingrained in new forms of practice.

User experience professionals, the graduates of our respective programs, need the skills to tackle the intractable challenges of the 21st century—surveillance capitalism, an unfolding and escalating climate crisis, increasing wage disparity, and the societal impact of quickly evolving Artificial Intelligence, to name a few. User centered design is quickly being outstepped by wicked problems that involve so much

more than a set of personas, pain points, and sticky notes can achieve. Forlano argues that design is not yet equipped to deal with the “problems, questions, opportunities, and solutions” in a way that truly takes the nonhuman seriously [10]. In short, students must learn to think with nonhumans and pedagogical strategies must help students do so.

Barad (interviewed in Rick Dolphijn and Iris van der Tuin [4]) uses the term “agential realism” to help us understand that everything has a certain kind of agency, but such agency is enacted across asymmetrical lines of power. This understanding, in its realist sense, encourages us to consider what agencies are in the world, and how to work with them. Understanding the real agency of things and beings enables us to address power imbalances. Barad argues that “Agency is about possibilities for worldly re-configurings.” A key underlying concept of agential realism is intra-action, which she calls “an ongoing open process of mattering through which ‘mattering’ itself acquires meaning and form in the realization of different agential possibilities.” This is in opposition to interaction, which presupposes the existence and relational aspect of already mattered (that is, objectified) phenomena. Through intra-actions the entanglement of matter with the material-discursive strand in cultural theory is given new theoretical instruments with which to dismantle the old dualisms and transcendences. Haraway advises against the ‘god trick’ of positioning ourselves as designers outside of, and separate from the world around us [13]. Instead we are inevitably, and thus ethically, intertwined with it. In design this would imply that we think of ourselves as comprising a design material, connecting to the embodiment motif mobilised by feminist theory, or perhaps that ways of shaping and arranging materials by hand or by mind involves an ethical entanglement with making things. Being, acting, and knowing (the onto-ethico-epistemology proposed by Barad) converge in matter.

Similarly, Forlano [10] argues for understanding how “capabilities, agency, and power [are] distributed across human, machines, and natural systems”. This requires new avenues of research, ethics, and partnerships for design. This is a shift from humanistic, user centered, approaches to posthuman thinking. This epistemological shift, while not well defined, shares a number of strategies and values. Core to this is a resistance to dualisms through the valorization of non-binary categories. A “human and nonhuman” dualism elides the nuances between nonhuman entities, such as mushrooms, chickens, and AI, for example. Posthumanism provides a way to consider the specificity and situatedness of nonhuman entities, while providing the same clarity for considering humans [25]. Designers need tools for understanding theory, and HCI curricula need to see beyond the evaluation paradigm they currently prioritise.

In terms of a material shift in HCI, Dourish [9] articulates the argument for considering computational resources such as routing algorithms, excel documents, and databases as matter. He suggests that the nature of these resources both shapes and is shaped by social forces and that the constraints of computational matter are unevenly applied. The challenge for designers in HCI is how to configure invisible or dematerialised matter into meaningful gestalt whilst avoiding the traps of dualistic thinking such as user/system or designer/user. Dourish suggests that representations are fundamental to this challenge in terms of the possible forms that computational resources may take. Dourish also notes HCI’s “...overweening preoccupation with the design of new objects...” that are often adrift from the material contingencies they embody. Designers do not limit themselves only to representation but are concerned with bringing new things into the world. Increasingly, these things are intangible such as services or systems. The nature of material engagements in HCI must therefore connect the systemic and

infrastructural to the socio-materialistic, the interactive and the intra-active. Bratton [7] poses the notion of 'the stack' to describe the layered nature of digital infrastructure, moving from the earth layer, through cloud, city, address, interface to the user layer. This metaphor is geographic in nature and builds on a concept of materiality that encompasses global flows of power and matter entangled in discursive relation. Bratton ends the user layer section with an exhortation "forget human-centered design; we need to design for what comes next." We propose in this provocation that HCI curricula are not currently well-placed to train designers for what comes next, focused as they are on task analysis, and analytic and empirical evaluation methods alongside, for example, sketching, developing personas, storyboarding, wireframing, and prototyping.

Methods in HCI

The common practice-based elements of HCI can be seen in this description of an HCI curriculum module:

Taking a global view of HCI the methods students are encouraged to deploy in their work can be stifling in their orthodoxy. The dominant paradigm of user-centered discovery, prototyping, testing, and development, while itself unconstrained by particular methods too often defaults to an unquestioned conventionality. The user-centered discovery process features interviews, focus groups, and personas. Prototypes are limited to paper or digital versions. Testing is done with uncritical usability techniques such as card sorting, remote sensing, or observation. Development and delivery ensue from there. We suggest that the material turn taken up so widely in cultural studies [5] and critical art practice [20] has, with rare exceptions, [11] so far received limited and shallow expression in HCI [21] and has yet to touch HCI education. This is due to a number of related factors; a pervasive conservatism in HCI academia, a

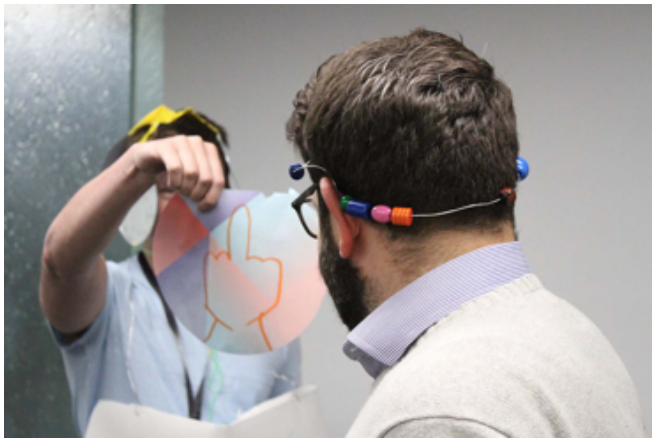

Figure 1: Imagining the process of training a machine learning algorithm how to categorise and respond to human gestures.

methodological insecurity that overvalues tried and tested methods, and an unhealthy and unequal relationship with industry. Instead we demonstrate ways for students to encounter materials in the course of their HCI education that feature embodied, spatial, and performative methods.

Embodied methods

Embodied design methods are well known in performance [6] and product design [22] but are overlooked in HCI. What we mean by embodiment is well summed up by Abramson and Lindgren [1] as "...the situated, spatial–dynamical, and somatic phenomenology of the person." This way of thinking in HCI has been limited to tangible interaction design and an examination of how people interact with technologies. The way we have employed embodied methods in our work teaching HCI is by framing encounters with technology as involving more than cognitive work. In Figure 1

Figure 2: Embodiment of the design process using using wool, paper notes and the student, herself.

Figure 3: Students working on a project about loneliness made a physical archway that illuminates when someone walks through it.

two designers are imagining the process of training a machine learning algorithm how to categorise and respond to human gestures. One participant embodies the algorithm. He holds up recognition drawings as the other participant, who wears a headset that connects directly to the machine, makes gestures in front of him. This process forces the designers to use their whole bodies as a way of revealing and magnifying the black-boxed workings of algorithmic processes.

Similarly, in Figure 2 a student is demonstrating the design process using wool, paper notes and herself. She is attempting to show the confusing mess of impressions, abilities, and practice in HCI and UX design connected directly to her head with annotations such as 'learn the context' and 'theoretical knowledge'. This kind of embodied representation allows implicit understanding to make its way out of her head and into the world in a way that can be shared and discussed.

Spatial methods

Like embodied methods, spatial inquiry and spatial design methods have a rich history in architecture [18] and landscape design [2]) where drawings and models are common ways of communicating design ideas and working through concepts.

We use these methods in HCI teaching to engage students in the contextual and real world implications of their work. As an example of the issues we try to address, Allen [3] has noted the cost of dematerialised and de-spatialized relationships between data and people from the perspective of copying and authenticity. By asking students to spatialize their work in HCI we aim to highlight some of these costs and to emphasise that technologies, like people, exist in a physical and spatial relation to each other.

In Figure 3 students working on a project about loneliness made a physical archway that illuminates when someone walks through it. The form of the arch was the outcome of a research process during which students asked participants to make physical models of their experiences with digital loneliness. By expanding outwards into three dimensions and spatializing their ideas they manage to involve people in the work and stimulate conversation about the alienating effects of digital interfaces and social media habits, usually experienced as an isolating and individual experience [19]).

The effects of spatial methods in HCI education can be far reaching. Figure 4 shows students presenting outcomes from a brief that required them to design the user experience of democracy. The group, with male and female participants from Slovenia, Ireland, China, and Iraq designed a space where people could debate political ideas in a place of safety, oscillating between individual and group discussion. This galvanised a long and intense conversation about what it is possible to say, what kinds of spaces exist for open debate and the enfolding and filtered nature of digital interfaces that frame and present political argument. Spatial expression in this case enabled the nuances of differing views to emerge in group discussion, this has continued to influence how students speak to each other, and respect each others views and driven their studies in HCI and UX into new critical directions.

Performative methods

Performative methods including bodystorming [23], and role play [24], are certainly known in interaction design and have been used to understand user needs and capture player interactions in games design. The way we have used performative methods in our work teaching HCI and UX are by contrast generative and explicative, rather than investigative. We are less interested in asking other people to

Figure 4: Spatial expression as a means to explore the meanings of democracy.

Figure 5: Students playing through an idea for a digital translation device that would help them avoid embarrassment when ordering in cafes and restaurants.

perform for us as a way to inform our designs or capture their data. Instead, we encourage the use of performative methods to explore ideas, communicate those ideas and allow for serendipitous discovery.

In Figure 5 we see students playing through an idea for a digital translation device that would help them avoid embarrassment when ordering in cafes and restaurants. By creating a full-scale conversation between customer and server, staging the moment of embarrassment, and allowing the situation to play out in real time, design opportunities emerge. In this case it became clear that the latency required to interrupt a social interaction with a digital one did not help overcome the social awkwardness of trying to communicate in a foreign language. Instead, it introduced a new and unexpected type of difficulty.

In Figure 6 a student demonstrates a home cooking voice assistant. He enacts the process of cooking a meal with minimal props, miming the actions while another student gives instructions through a voice activated speaker. Designing for such a scenario can be a complex task. Awareness of context, such as other people talking, music playing, the speed of instructions, lack of understanding on the part of both human and machine, and the spatial arrangement of utensils and the cooking surface were all revealed by this performance. The folding of visual interfaces into voice activated devices realized in this performative explanation creates new and unexpected challenges related to the entangled interplay of domestic spaces, artefacts and actions, social interruption, and background noise. It is easy to miss these if students confine themselves to paper prototypes and screen wireframes.

Pedagogy

Drawing upon our teaching experiences that these examples illustrate, we call for a more detailed and conscious understanding of what it means to engage in a practice-based discipline, one that acknowledges the politics of practice. “[A]rtifacts are used for political ends: to express beliefs, desires, and attachments that have political significance” [8]. Designing artifacts, then, is also a political act. Design students, and here we refer broadly to HCI fields, must understand embrace the politics of their work.“Prototyping becomes a way of engaging with these materials, of imagining their possibilities and giving form to their qualities by defining their use”. This approach refers to a theoretical and politically astute making process as “critical making” [7],[8]. Ratto writes, “The use of the term critical making to describe our work signals a desire to theoretically and pragmatically connect two modes of engagement with the world that are often held separate—critical thinking, typically understood as conceptually and linguistically based, and physical “making,” goal-based material work." We argue that HCI curricula should evolve a pedagogy that mandates students employ critical making to cultivate a perspective on their situatedness as materials of design intra-acting with other materialities. They must shed the stance of doing the “god-trick.”

As Grandhi [12] points out, in spite of several ACM-sponsored initiatives, the HCI community has struggled for years to define the scope of the field and by extension, what should be taught. There are advantages to an undefined field that allow for experimental and exploratory approaches that HCI curricula do not seem to capitalise on. More usually HCI programs, while increasingly aware of speculative and critical methods, default to a logocentric pedagogical approach in which students are expected to acquire knowledge without an enriching fluency in contextual awareness derived

Figure 6: Enacting cooking with a voice-enabled digital assistant. More than "Wizard-of-Oz" prototyping.

from material engagement. In curriculum design and individual pedagogy HCI programs can overdetermine student learning outcomes towards industry needs.

HCI and design programs with strong industry orientation run the risk of training UX drones, following user-centered design procedures, e.g., interviewing, affinity diagrams, and a set of personas that drill into product pain points. Such skill sets uncritically reinforce the early HCI efficiency paradigm, aiming to smooth the way for the rise of easy to use digital products on an industrial scale. This has proved to be of little help. It does not allow the consumers of digital products, let alone industry and researchers, to consider new materialist and posthuman concerns, e.g., environmental collapse, mass species extinction, labor relations around the world, or extractive data-capitalism.

This, of course, presents pedagogical challenges. It is easy to evaluate whether students are able to design an effective study that assesses time-to-complete tasks or measures reduction in user errors, or A/B testing to optimize paths to add-to-cart. Regrettably, this is often what constitutes critique in HCI education. The materialist approach described above calls for critique and dialogue found in critical art practices such as studio pedagogy or the more dialogical evaluative methods used in studio based design disciplines such as architecture or fashion. These pedagogies, all too often dismissed in HCI education, can lead us to new methods of educational sophistication. The two approaches can inform one another, creating critical practitioners prepared not only to work in industry, but to push it to new realms. Our students, and our planet, are ready for such change.

Conclusions

We have shown how our experience as educators has elucidated a need for HCI educators to cultivate in students a critical view of the relationship between people and objects. An increased attention to working in material form, and considerations of where and how contemporary computing infrastructure comes from in the world can help young designers articulate and make clear the politics of their design artifacts. This requires new approaches to teaching and learning.

Pedagogical strategies must include practices of critique that help students explain design rationale relationally to both theory and pragmatics. This means educators must be able to partake in non-dualist arguments, engage in the sea of ideas with students to debate, mentor, and improve their ability to articulate their design goals and concerns. We must change so that they may benefit. Thus, can we move HCI education to generative, ludic studio critique that does not replace the practical assessments which appeal to industry, but add to them and prepare students for ambiguous, emergent design contexts of the future.

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