Value Sensitive Speculative Design: Exploring More-Than-Human Relations in the Age of Climate Catastrophe.

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Abstract. As issues of climate change become more apparent and intertwined with our daily lives, calls for action amplify. The causes and effects of anthropogenic climate change (rising temperatures and oceans, drought, wildfire, famine, refugees within the paradigm of late-stage capitalism) equate to a wicked problem. Yet, the problem is not humanity's alone. Living nonhuman organisms experience ecological shifts and disruptions also. Climate change requires a more-than-human perspective if we are to approach these problems ethically. HCI has become increasingly interested in the projects, visions, and narratives that investigate this complexity. However, research and pedagogy do not always emerge at the same rate; questions of how to teach this remain. In this article, we offer a description of and reflection on two of our courses from September-December 2020 and March-June 2021, offered at the University of Washington, Seattle, as examples of Value Sensitive Speculative Design (VSSD) in HCI pedagogy in the face of climate change. A collective group of 20 graduate and undergraduate students worked together over the course of two 10-week quarters in virtual sessions. Building on the Value Sensitive Design framework, we used speculative, discursive, and more-than-human concepts as an approach to expand the student's 'designer mindset' and ability to notice complexity and richness in emerging and entangled relations. We discuss the struggles and troubles and conclude with future work &/or further design education.

Keywords: Speculative design, discursive design, value sensitive design, more-than-human, climate change, HCI pedagogy.

1 Introduction

In August of 2021, the *State of the Climate in 2020* report was released, "placing singular events and annual means in the context of climate" [1]. In the report, climate change is defined as "the long-term trend" of a changing climate [1] They provide a list of "essential climate variables," including but not limited to atmospheres (e.g., air pressure, precipitation, temperature, water vapor), ocean physics (ocean surface heat flux, sea ice, sea level, salinity), ocean biogeochemistry, ocean biogeosystems, and land (river discharge, snow, fire, soil moisture) [1]. Climate change consists of two

related sources: anthropogenic climate change and natural climate change. Energy Education Encyclopedia defines anthropogenic climate as "the human impact on Earth's climate" such as burning of fossil fuels, aerosol releases, and land alteration from agriculture and deforestation; and natural climate change is defined as "the natural climate cycles that have been and continue to occur throughout Earth's history" [2]. The report illustrates how these changes result in a variety of critical issues across the globe, for example: food shortages, flooding and landslides, extreme heat waves, biodiversity loss, and an increase in flammability of forested landscapes [1].

The consequences and implications of climate change have not been well developed within design fields and climate change is sorely lacking in HCI education. This may be due to the fact that issues of climate change are so vast and complicated, they are "wicked problems" [3]. However, as academic researchers and educators, we see the need to incorporate climate concerns in every way that we can, especially in our classrooms. Climate change is one of the intractable challenges of the 21st century and our courses of human-centered design need bolstering if we have any hope of designing in response to climate change. We believe that climate change requires new methods, approaches, and stories that incorporate *more-than-human* (MtH) concepts, if we are to productively combat anthropogenic climate change. That is, considering nonhuman life in our response(s) to climate change is a means of challenging human-centric perspectives and practices that propel climate change. More-than-human concepts in design contexts are underdeveloped. We see these concepts as a fruitful entry point to consider and develop new design stories regarding our uncertain climate future, and the values therein. As such, it is an excellent topic through which to teach discursive and speculative design practices.

Discursive design is a broad umbrella term that encapsulates non-normative design practice (e.g., critical design, speculative design, radical design, etc.). "While having differences of approach, instantiation, and effect, they all are unified in their concern for intellectual impact" [4]. *Speculative design*, according to Auger, semantically signals an emphasis on the difference between the present and the fictional world from which the design object originates [5]. The resulting design artifacts, according to Tharp and Tharp, are "goods for thinking" [4]. As such, we introduce speculative design as a practice amenable to considering possible futures and ethical quandaries brought forth by climate change. In what follows, we use the terms speculative design and discursive design somewhat interchangeably. The very practice of designing with nonhumans in mind, or for a more-than-human-centered design, requires some speculative work. Furthermore, as design educators, we have found that designing speculatively forces students to use their design skills (visual artifacts, storytelling, creative problem solving, etc.) in new, sophisticated ways. Such work helps young designers grow into their voice and perspective.

Value sensitive design (VSD) has been a major contribution to the Human-Centered Design (HCD) space since the mid 90s, providing theory and methods that raise awareness to *human values,* from multiple stakeholders who are directly and indirectly impacted by the technology being assessed or designed [6]. One VSD method that we utilize in our classes is called *value scenarios* - a process of writing a short story that reveals the value tensions at play when stakeholders interact with technology. VSD provides many methods for expanding the context of design to

include the entanglement and complexity of multiple stakeholders. VSD helps us identify human values and consequences and is a very human-centered approach. This is a very useful and noble endeavor; however, it fails to address values and ethical tension that exist beyond human contexts. However, when VSD methods are combined with more-than-human concepts and discursive and speculative design perspectives, new opportunities emerge.

In this article, we propose *value sensitive speculative design* (VSSD) – a novel design approach of pairing VSD, discursive and speculative design, and MtH concepts – and reflect on teaching VSSD in an HCI context. In our experience, as we will discuss, we see that within the context of VSSD students grow as designers, considering values, methods, and practice in general in more sophisticated ways. In what follows, we discuss the positioning of our course within a larger human-centered design and engineering curriculum, specific pedagogical examples from our courses, and conclude with interviews with students from both courses and a reflection on teaching speculative design by the authors.

We see speculative and discursive design practice as a critical aspect to design education. However, adding speculative classes to existing curriculum comes with challenges. Finding space in the curriculum, managing enrollment, and the general bureaucracy of curricular and classroom management can limit creative pedagogy. Rather than create a new course, we have had success in mobilizing "*Directed Research Groups*" (DRGs) to teach low-credit, nongraded courses. These are common in our department, offered to facilitate research performed by faculty and PhD students. We see these kinds of courses elsewhere on our campus and at other institutions – small, flexible seminar, research, and design courses that can be created quickly and are led by the research interest of an individual, rather than serving an entire curriculum. We took advantage of this flexibility to explore climate change and speculative design to better understand how to teach these topics. Once complete, we chose to reflect upon our experiences teaching speculative design, and to attain informal feedback from our students. We find that speculative design is a useful pedagogical approach to level-up our students. We hope to leave students with new perspectives to incorporate into their designer mindset and disseminate into their career trajectory.

About the DRGs: In September-December 2020 and March-June 2021 we developed and taught two DRGs that focused on climate change futures and speculative practices. The 2020 DRG, "Post(-)Human Hazmat" (led by Beach) culminated in a digital zine[1] of comics that explored ethical concerns of more-than-human entanglements, written and illustrated by individual students registered for the course. In the 2021 DRG, "The UX of Climate Change" (led by Fox) culminated in individual, speculative design proposals for human-nonhuman relations in the face of climate change, with an emphasis on human-tree relations. Though differently focused, the two courses shared a similar approach, braiding three specific theoretical and methodological strands together – VSSD – through which to consider future climate experiences and environments. We had roughly 20 students divided evenly

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[1] The final zine for Post(-)Human Hazmat can be found here:
https://www.hcde.washington.edu/designing-up/2021/post-human-hazmat/

across the two DRGs with a mix of undergraduate and graduate students in each. Most students were majors from our department, Human Centered Design & Engineering, but we were joined by a few students from other majors (Design, humanities, etc.).

Both courses drew upon theorists concerned with more-than-human relations, such as Donna Haraway, Anna Tsing, Laura Forlano, and Anne Galloway, to name a few. We also incorporated working sessions inspired by Value Sensitive Design (VSD), followed by writings and specific projects from members of the speculative/critical/discursive design community(ies). Due to the pandemic, both courses were also taught remotely, for which we relied almost exclusively on Zoom, Miro, and Slack. Most of our course time was spent either in discussion, especially during the early weeks of the class, and critique of comics and design ideas, which students steadily refined over the last portion of the course.

Author positioning. We are designers and theorists interested in pushing the boundaries of design discourse and education. Following Tharp & Tharp, we believe that discursive design is an umbrella term for speculative, critical, radical, fabulatory, futuring, and other design approaches that provoke audiences to consider what, how, and why design should do in the world [4]. We believe that speculative design in particular is a practice focused on possible futures, from the dystopic to utopic, preferable and possible. Such discursive activities, while growing in popularity, are positioned in opposition to normative design–the design of consumer products, services, and experiences in ways that neither question nor necessarily push designers to critically consider the broader role of design in the world. As educators, we strongly believe that young designers require exposure to discursive design.

And yet, as powerful as discursive and speculative design (and their ilk) are, we also recognize existing limitations. One such limitation is a lack of theory. In particular, we pull on the works of Donna Haraway, Anna Tsing, Laura Forlano, among others to understand how design (especially discursive designs) can help us as thinkers approach new ideas, recognize relations between designers, their design objects, and their audiences and users. In teaching discursive design, we have chosen to include theorists whose work pushes us to think differently about the world we live in, and to attempt to integrate this into our coursework, and ideally the design work of our students. While we are never completely successful in this, we recognize a growth of sophistication in our student's work due in part to the theories we introduce them to. Particular to our work and research interests, we also see these particular authors as part of a vanguard of theorists who recognize a world beyond humans. We believe that the next wave of design will focus on a more-than-human-centered approach to the world. Theorists like Haraway and Tsing help provide insight into the entangled relations of humans and nonhumans that such an approach requires. This is especially true when designing within the context of climate change and uncertain futures, which we will discuss more below.

Finally, we are in agreement with a number of critiques of the exclusivity of discursive design. Practitioners and authors of this broad field of design are often white (as are both of us), academics (as are we), and from western/euro-centric backgrounds (again, as we are). Fortunately, many of the students we work with are not white. While this is not (yet) a solution to the critiques of discursive design, it is

also hopeful. In our role as educators, we see the value of helping our students, especially BIPOC students, learn to push the boundaries of design through the critical and speculative moves to open up design discourse from new perspectives and approaches.

In what follows, we reflect upon two DRGs where we introduced undergraduate and graduate students to more-than-human theories and discursive and speculative design approaches. We set out to understand what impact these classes had on individual students, specifically those who have been trained in human- and user-centered design. From our perspective, such practices trouble traditional design education in the most productive ways, and we set out to see if we could find evidence of this within our students. To do so, we interviewed five students. They volunteered to participate from a pool of roughly 20 students who were in our courses. Of the five students who participated in interviews only one identifies as white, and only one identifies as male. We chose to run semi-structured interviews with the five students. The authors then analyzed the interviews, looking for commonalities and insights specific to educational outcomes and experiences. This can be found in section 4, "Reflections." We begin with a description of our pedagogical approach in relation to the core curriculum of our program.

2 Class Positioning

Our department teaches human-centered design & engineering. In the core curriculum, students learn and apply research, design, prototyping, and engineering skills to meet the needs of potential users. They learn how to justify design decisions based on what they know and understand about the people for whom they design, and they learn to articulate these decisions to other audiences. This requires them to consider the ethics and values of their designs as well. However, as others have written [7], we notice that such dependence on and desire to please the "user" can lead to more conservative design ideas. Another way to say this is that a hyper focus on the "user" leads students to tried-and-true practices of industry (personas, design ethnography, surveys, etc.), rather than developing their own ideas and values of what makes 'good design.'

Our DRGs sit outside of the core curriculum. We are not required to teach them, nor are our students required to sign up for them. However, as researchers and educators, we share a strong commitment to the topics of climate change and speculative design.

In fact, we believe that designing for our current and future climate catastrophes *requires* speculation and provocations. Thus, we believe that these small courses are valuable to mobilize students in climate-aware trajectories.

We found that our small courses in speculative design open young designers up to new methodologies, new *ways of thinking*, and highlight design decision making by challenging to go beyond "the user." As such, they must wrestle with different values, goals, and outcomes than traditional user-centered approaches. Bruce and Stephanie Tharp say that discursive design produces "goods for thinking" [4]. They argue that (successful) discursive projects force good thinking – we agree, and the good thinking

comes from both the designers and the audience. Design is much more than just the user and the business, it is a complex orchestration of teams, methodologies, practices, and prototyping that requires reflection and critical perspective. Löwgren and Stolterman describe this as "thoughtful design" [8]. They go on to describe a set of design attributes needed to excel as a designer, including ability, intelligence, values, aesthetic sensibility, and judgement [8].

This is not only challenging for the designer, but it is also a challenging pedagogical demand, especially as Löwgren and Stolterman emphasize: there is never one right answer in design. Increasing one's design ability requires a breadth of practice, critique, iteration, and gaining skill. We contend that speculative design is of critical value for design students in the 21st century in the ways that it highlights tensions and relations of a more-than-human centered world.

Furthermore, the goals of speculative practice are to provoke thought and experience to what-if statements, which is orthogonal to how-might-we questions of typical design practice. As such, we believe that speculative practices help young designers push against the, arguable, inherent conservatism of user-centered design [7].

Our university is on the quarter system. We have three academic quarters consisting of 10 weeks each. Our class met once, weekly. For us to achieve success in our course goals, we have learned to also make them extremely focused. We choose our theoretical exemplars with care, ensuring that we are familiar enough with them to help our students understand them well enough to mobilize them. As we describe below, we structure our courses to frontload theoretical readings in the first half of the quarter, while using digital whiteboards to scaffold and structure class discussions and visual responses to the readings. Then, around the halfway point, we shift emphasis to design activities supporting individual projects.

3 Pedagogical Practice

As mentioned above, both courses focused explicitly on climate change and future climate scenarios. We feel that climate change and the legacies of settler-colonial capitalism are one of the most important and complex challenges of the 21st century and must be at the center of all design for the foreseeable future. To support this, we needed to find a way of scaffolding the content so that students unfamiliar with speculative practice would not get lost along the way. We believe that beginning with theory is useful for a few reasons. First, it introduces new concepts from outside the student's experience and familiarity. Beginning with theory in our class grounds concepts and allows time for us, as a learning community, to return to topics and ideas over time – shared theoretical touchpoints through which to examine and critique future work. Finally, we see, anecdotally, that many students benefit from time to fully understand dense theoretical material in order to forge connections with their designs. By introducing this material early, and returning to it in discussion and critique, we scaffold the course more strongly.

Following theory, we introduced values through a VSD workshop. This was done explicitly in the 2020 DRG (see below), and implicitly in the 2021 DRG. As the goal

of speculative design is to provoke critical thought, an exercise in value sensitive design can quickly draw out value tensions between different stakeholders in any design context. We did this to help our students understand which values they wanted to address in their designs and stories.

Finally, we introduce different speculative projects by and read from speculative, critical, discursive designers. This provides students examples of design projects, but also provides potential methodological approaches that they can adopt for their designs.

Interspersed with all of this is a commitment to developing the community of our classes. Our meetings, while brief, are very active. Putting students into breakouts in pairs or small groups increases time with one another with attention from the instructors. One of our goals as instructors is to be very familiar with student projects so that we can be as supportive and encouraging as possible. We have found that for critique to be successful, especially for speculative projects where students are unfamiliar with the practice of provocation through design, trust in the community of practitioners is critical. Designing for 'good thinking,' whether it be a visual story, a physical object, or even a potential service is difficult. Designers need a community that can provide constructive feedback that helps individuals know what message(s) comes through their work, and how they can intensify the attributes that they find important for their designs. They must trust this community to truly listen to the critique.

3.1 More-Than-Human Theories

We feel strongly that designing for more-than-human theories requires a rigorous inquiry into nonhuman worlds and potentials. As such, we incorporate material (readings, podcasts, films, videos, zines, comics, etc.) that considers the lived worlds of octopuses, sheep, and trees. To be speculative, we must think beyond the borders and practices of design. This includes STS articles, new science publications on both the climate and animal relations to the world. Theories of the cross-species entanglement found in the work of Anne Galloway, Anna Tsing, Donna Haraway, and Laura Forlano help to provide a perspective on more-than-human-centered design.
Such work is not only about fostering inspiration and deeper thought surrounding human-nonhuman relations, but also the very practice of design. Forlano makes a strong call for the importance of posthumanist theories for design, positing a new kind of design [9]. Forlano sees the role of posthuman positions in business now. Citing Perdue's goal of improving the state of chicken factory farms, Forlano asks, "What if, rather than understanding the needs of humans, designers are tasked to understand what chickens want? What expertise or theories might be needed in order to address this problem? What models, methods, frameworks, and sensibilities might be essential for exploring possible solutions?" [9] Designing for nonhumans offers a new perspective for most of our students. It is also of critical importance to HCI & UX students and practitioners. Technology is involved in so many of our relationships with nonhumans, from pet cameras, tracking wool for consumers, raising livestock, watering plants…the list of technological "solutions" to a variety of human-nonhuman relations reveal that the makers of future technical platforms must be able

to understand more than "the user." Human Centered Design education currently lacks such crucial capacity building for more-than-human-centered thinking and designing.

Fig. 1. Excerpt from More-than-human Miro activity from 2020 DRG, Haraway's Sympoiesis[2] reading and discussion.

Theories of a more-than-human world offer more than distinct design opportunities than simply swapping out a nonhuman for whom to design. Such theories offer rich entanglements of experience and conceptualization. For instance, Donna Haraway's concept of sympoiesis – acts of multispecies co-creation – offers a rich way to challenge human exceptionalism and provides an excellent lens through which to consider principles of co- and participatory design [10]. Sympoeisis encourages us to consider speculative design opportunities with nonhumans, current design practices, and the entrenched ethics of both. Such readings force students to think beyond their own design ideas, beyond designing only for humans, and to offer new potent

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[2] Haraway, Donna. "Symbiogenesis, sympoiesis, and art science activisms for staying with the trouble." Arts of living on a damaged planet (2017): M25-M50.

perspectives on design. Figure 1 (above) is a screenshot of one of our Miro board activities that provided scaffolding for group discussion.

Often, the discussion of these readings falls into two very broad categories: inspiration and ethics [for lack of a better word]. We position Haraway's consistent call for "new stories' as a call to young designers to strike out for weird territories of design potential [11]. This, we have found, is important for students who are taught to adhere to user-centered principles. Removing the "user" can be profoundly challenging for our students. New design stories means moving away from users toward a relational practice of design. Similarly, such work is grounded in an ethics of serving nonhuman actants in our world; thus, we have found readings in theory to help students articulate how their work is ethically or provocatively informed.

3.2 Speculative Practice

Our students are mostly unfamiliar with speculative design, both in theory and in practice. Thus, we use examples and frameworks that introduce speculative methods and approaches. Here we offer a description of one class activity as an example of how we mobilized this material in our classes.

We assigned two articles, James Auger's "Speculative Design: Crafting the Speculation" [5] and "Expanding Modes of Reflection in Design Futuring," by Kozubaev et. Al [12]. Both readings provide frameworks for speculative design and design futures; we sought to bring them together as both an analytical and creative approach.

Auger describes speculative design as a speculative bridge between the audience and the fictional world in which the design exists [5]. He lays out six approaches to managing this perceptual bridge: (1) the ecological approach (considering the environment or context in which of the fictional design), (2) the uncanny (provoking the audience through unsettling, or discomforting, topics or scenarios), (3) verisimilitude (presenting the fictional design as realistically as possible, "design *factions"* rather than design fictions), (4) observational comedy (mobilizing mundane aspects of everyday in service of more preposterous, and funny, design scenarios), (5) counterfactual (considering design alternatives to our current quotidian experiences) and (6) domestication (placing speculative design approaches within the lens of the intimate co-lived experience of domestication) [5].

Kozubaev et. al. offers a broader perspective of design futuring (rather than only or primarily speculative practice) [12]. Rather than considering the methodological approach of managing one's speculation, they seek to consider the reflective approach designers seek, or achieve, through their work. They offer five reflective modes: (1) formgiving (the materiality of specific designs and how this materiality shapes thinking of the future), (2) temporal representations (thoughtfully framing the temporality of one's design, the authors argue for a framing that underscores "malleable and contestable" temporality to open possibility), (3) positionality (explicitly sharing from where the future design happens, and by whom it is designed, core here is an acknowledgement of privilege, access, and power for design futures are potentially "world-shaping") (4) engaging with the real world (here the authors argue for a more participatory practice of design futuring that invites the public into

the process more), and (5) generating knowledge (considering the value of design futuring as a research method and understanding how such work can be argued for).

We began our class with a detailed discussion of Auger's methodological approaches (see Figure 4 below); this ensured a stronger understanding of his design methods (which we felt better supported the student's end term requirements). We then provided a Miro board with a grid composed of Auger's six methods (horizontally arranged on virtual sticky notes) and the five modes of reflection from Kozubaev (arranged vertically on sticky notes), with a corresponding note under each. Working in small groups, students were asked to quickly combine a speculative method with a reflective mode and consider our topic (future care of trees by humans) (see Figure 2 below). When considering temporal representations with the uncanny, one group wrote, "ghost of tree past, present, future." When considering positionality and observational comedy, another wrote, "owning a tree symbolizes higher social status."

Fig. 2. Miro board from the 2021 DRG, for the Auger and Kozubaev activity.

This exercise was meant to concretize the concepts in both papers for students. Theory can be abstract and difficult to integrate into design projects in a meaningful way. The exercise afforded a lightweight approach to ideating through these principles. However, our goal was less to develop a fully formed design idea, and more to mobilize the concepts from each paper through design ideation, thereby making them more understandable and applicable.

Following this exercise, we discussed the ideas as a class. It was clear that the exercise was perhaps too abstract, making our quick pace challenging. Many of the ideas lacked details to help us understand how they related to Auger's broader methodological approaches. What is uncanny about the ghost of tree futures, one might ask. At the same time, the ideas provided rich dialogic experiences for us to drill down into the particularities of design choices. They allowed us to use the ideation session as "how might we" examples. How might we make something more

humorous, real, or uncanny? The exercise also afforded students an additional opportunity to bring up questions about the original papers and understand them more deeply.

3.3 Value Sensitive Design

In their book on VSD, Friedman and Hendry provide an example of a value scenario called "Value Scenario: One Dad's Dilemma" [6] which we look to for inspiration. The story follows the unraveling of trust and falling out between a parent and a teenage child due in part from the effects of a secretly installed tracking app. Our students discuss the tensions between the different stakeholders, and how the technology produces unwanted effects. Figure 2 (above) is a screenshot of our Miro board activity that provided scaffolding for group discussion around the value scenario example.
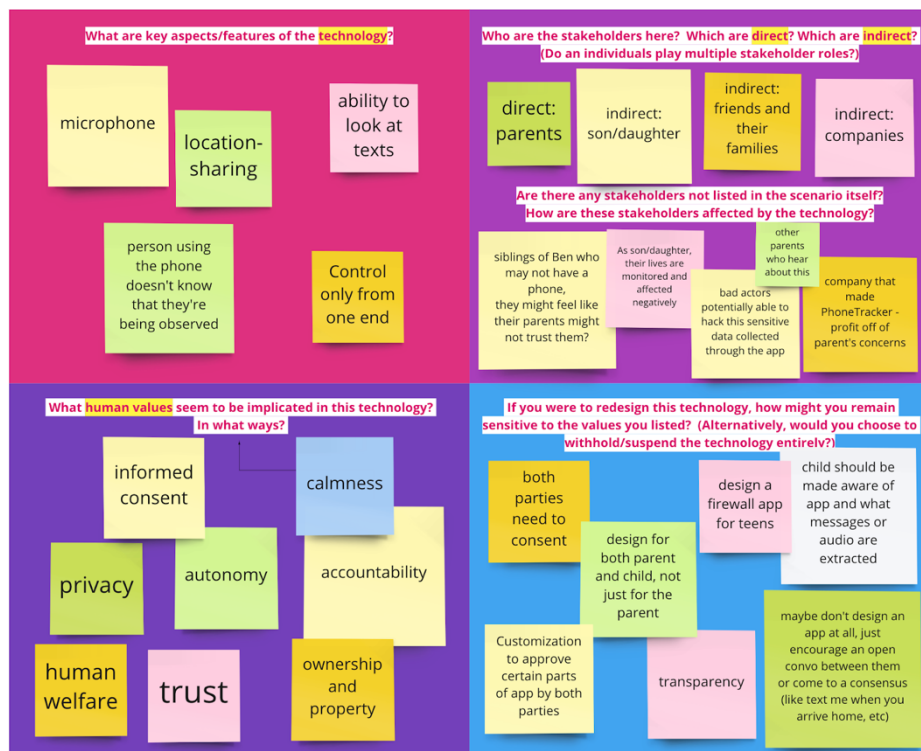
Fig. 3. Miro activity from the 2020 DRG, for Value Scenario example discussion.

The methods provided by VSD acted as scaffolding for our activities, and also an entry point and steppingstone for thinking about more- than-human values. Here we describe one approach to incorporating VSD with speculative design.

In the autumn course, students were tasked to asynchronously sketch out their own value scenario and to expand the framing to include more-than-human stakeholders. They were also tasked with listing out the direct and indirect stakeholders, the technologies involved, the values and tensions that the scenario presented, as well as the more-than-human and speculative concepts that we explored thus far.

3.4 Value Sensitive Speculative Design

Tying together the concepts from VSD, speculative design, and MtH into an iterative practice, we developed activities for VSSD. For example, we combined two concepts from our readings to build the VSSD activity: (1) the concept of value scenarios from Value Sensitive Design [6], and (2) the six key tenets of speculation developed by James Auger in Speculative Design: Crafting the Speculation [5]. We experimented with each concept independently in previous sessions, and then combined them into a method for critiquing and pushing the more-than-human story concepts further. This was done using a peer feedback template we developed on Miro (see Figure 4 below).

Fig. 4. Miro activity from the 2020 DRG, template for peer feedback session, combining Auger's 6 tenets of Crafting Speculation with VSD prompts for developing a value scenario.

The students brought a more-than-human value scenario into the following class session for peer-to-peer critique to gain feedback on their scenarios for the next iteration. The students applied Auger's 6 key tenets to their updated more-than-human value scenario sketches and brought them to class for critique. The work the students created was very diverse in topic, stakeholders, technology, and value tensions. Some were more solution oriented in addressing issues of climate change, plastic clean up, technological concepts for translation work between humans and nonhumans. While

others were more abstract, blurring the lines in the relationship between humans and nonhumans.
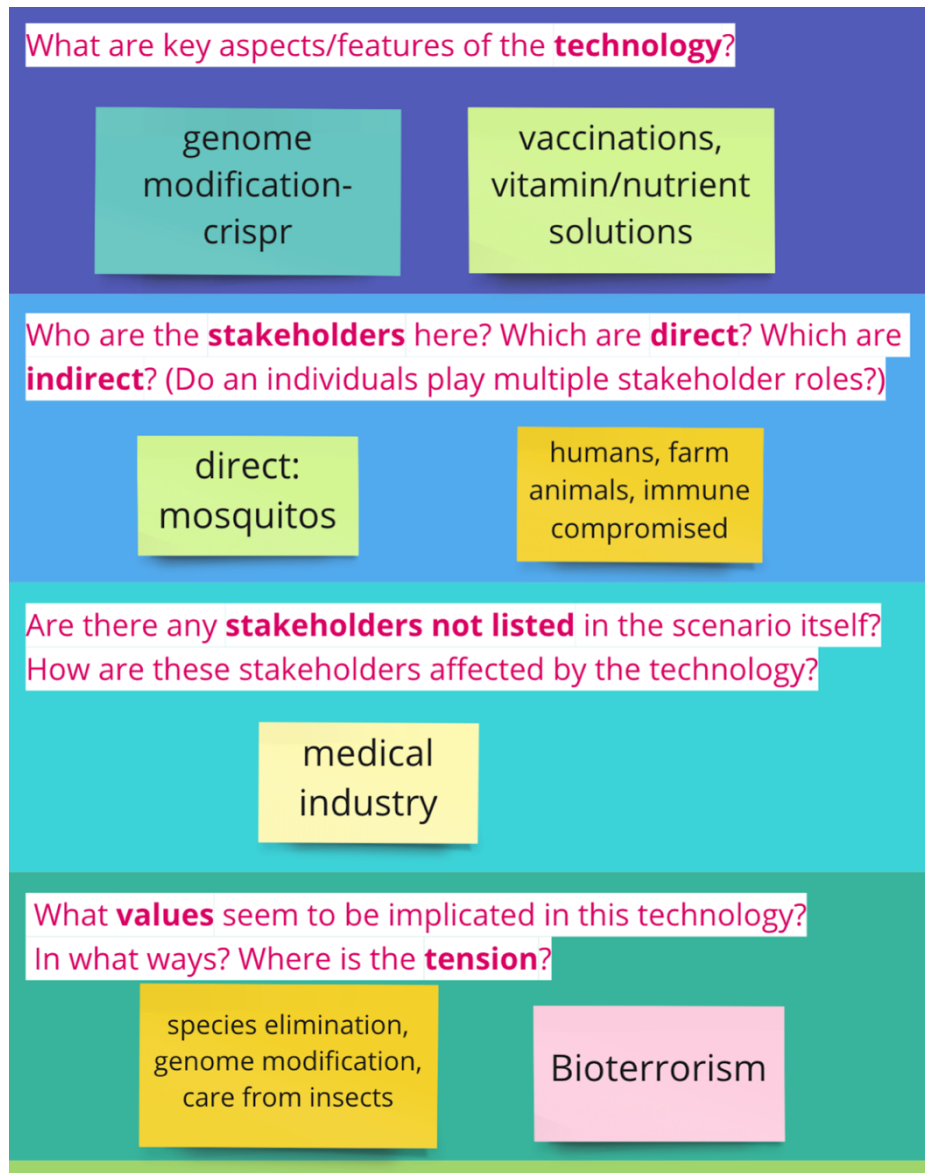
Fig. 5. Miro activity from the 2020 DRG, for applying the VSD portion in peer-feedback session.

We conducted a peer critique in small groups of three or four. Students took turns presenting their ideas and received feedback from the members of the small group

using the sticky note feature on Miro (see example of feedback in Figure 5 above) This activity allowed the students to evaluate the work done by their peers as well as reflect on their own work using the value scenarios criteria and the key tenets of crafting speculation to help shape our discussion. This was the final didactic aspect of the course, subsequent sessions focused on critique and iteration of their stories, illustrations, and development of the class zine. These value tensions and speculative work scaffolded critique in the final weeks of the course.

4 Reflections

We invited all of our students to participate in post-course interviews; 5 accepted. We conducted interviews with our students after the courses to better understand their experience through the course and explored materials and concepts. In this section, we present a synthesis of the student's responses and key findings that support the need for speculative practice in human-centered design and engineering spaces. The students identified key differences and challenges between user- and human-centered design and speculative & discursive design, the importance of climate change as a focus, and ways they experienced growth as a designer.

User-Centered Design and Speculative Practice. When asked to describe the user-centered design practice (UCD) in relation to speculative practice, most students said that UCD has a limited perspective that mostly focuses on the primary user of a technology rather than taking a larger perspective into account. UCD has very specific goals. While UCD can offer a clear process for brainstorming, prototyping and evaluating a design, students said UCD can be prescriptive and over-focused on a practicality that leads to more conservative design outcomes that maintain capitalism models of consumerism. Koyo, a 3rd year undergraduate student said that speculative practice offers a look beyond a user's immediate goals, at the larger context, to changes in society and issues of sustainability.

For the students, applying speculative methods was not always easy. For example, one student said, when working with UCD, you do not have to think about things that are sad and depressing, however, working with speculative and discursive methods you are intentionally trying to explore something uncomfortable or uncanny. But these tensions were seen as an opening to possibility. One of our students said that "with discursive design, there is no right or wrong answer, and this helps to think in new ways." Another said, "it really makes you stop and think." Taylor, a 2nd-year MS student in design, said, "I think discursive design helps to constantly think outside of the box a little bit and keep pushing things forward rather than just wash, rinse, repeat and in that cycle constantly." They elaborated, saying that speculative design allows you to move beyond technology, that other classes were technocentric and none of them addressed climate change. And it is true that speculative practice is well suited for thinking about the ethics and values of wicked problems like climate catastrophe, global pandemics, and socioeconomic dystopias.

Fig. 6. Excerpt from Patryia's final design proposal, "Air Trek" in 2021 DRG.

The students see value in speculative and discursive practice, not only in how it expands their awareness as designers, but also the ethics and values at stake in complex entanglements. Patriya, a 2nd-year MS student in HCDE said, "A lot of times, we work on consumer products, but we can go beyond thinking about money and think more on ethics" (Patriya). See an excerpt of Patriya's final project in the 2021 DRG in Figure 6 above.

Most of the students we interviewed referred to one of our mantras, "make it weird", as a great reminder that they have permission to make something weird and speculative, to let go of expectations. Someone referenced a podcast we listened to by Anne Galloway, that sometimes after thinking through a design and how it is situated, the best option is to not make it.

Climate Change and More-than-Human Perspectives. For both courses, climate change was a major theme, and our students were very happy about this. Climate change as a topic is important to the students that are coming through the program. One student found the topic validating, seeing potential routes for design beyond her previous, marketing-heavy, experience stating, "working in that scope of climate change and understanding that that is a scope I can work in as a designer, and knowing that there are other people out there that do it too" (Taylor).
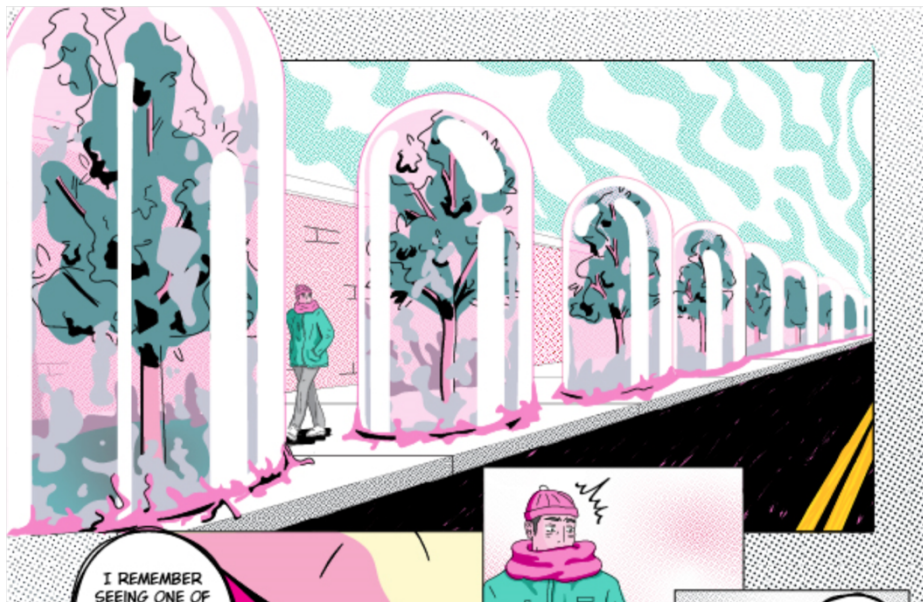

Fig. 7. Excerpt from Kyler's final design, "Breakout" in 2020 DRG.

Speculative and discursive design in the space of climate change offers different and wider temporalities. "I think working through speculative design and reading the papers on speculative design, kind of helped me realize how important it is to consider not just the immediate impact that a product has, but also, long term effects that it could have" (Koyo).

Speculative and discursive design are not always human-centered. Our students found connections between more-than-human concepts and human-centered design. Patriya said, "when caring for others and nonhumans, we're actually also caring for ourselves. In a way, these nonhuman practices are Human Centered Design" (Patriya).

In the 2020 DRG, Kyler explores the tensions between fungus and humans, fungus and plants, and plants and humans. He asks, should humans use fungus if it kills other organisms? At what point are humans and fungus considered a single organism? See an excerpt of Kyler's final project in Figure 7 above.

Good Designer & Shifting Mindset. Our students found value in linking theory to practice, saying that it makes their work more sophisticated. They report that the theories and concepts explored in class helped shift their mindset and open up new perspectives and provided new criteria by which to judge design. Speculative design was interesting to students who enjoy reading and working with theory, as speculative and discursive practices are more of an experiment where you try to "embed" thoughts and concepts into the design (paraphrasing Koyo and Ana). It created new tensions that supported "thinking differently" in the space of *big tech*. Another said, it helps prepare us for the future.

Instructor Reflection. Fox is Beach's PhD advisor, thus we worked closely together throughout both DRGs, in a mentoring relationship. Throughout this time we reflected on the goals of our course, student insights, design work, and critiques. Our reflections are based on our work teaching the DRGs, while also discussing the salient points of student interviews, conducted by Beach.

Our student interviews were helpful in understanding the impact of our courses. We see a clear impact on individual student's growth and development as designers. Nearly all of our interviewees noted the tensions between UCD and designing speculatively, which forces introspection about the strengths and limitations of UCD approaches. Our students shared concerns around prescriptive methods, an over-focus on practicality, short-term thinking, techno-solutionism, and the entrenched relationship between UCD approaches and capitalism. As Tharp and Tharp write, "Goods can be understood as congealed human values" [4]. Thus, the combination of VSD and Speculative Design can impact their understanding of design as a theoretical practice mobilizing values in society.

One striking comment, made by Patriya, was the inability of user-centered designers to stick with negative situations and mindsets. From our perspective, this seems a strong corollary to Donna Haraway's "staying with the trouble." In a world where designers are expected to solve problems, speculative design offers a counter example where designers expose and/or explore potential problems and experiences. Design proposals and experiential prototypes offer insights into new worlds, contexts, and experiences of these unresolved problems. Such work challenges the uniformity of UCD and pushes student's ability to use design to provoke and promote critical thought.

This is amplified by our student's reports of thinking differently, linking theory and practice more concretely, and feeling like they are more sophisticated designers. "It just made me have a different perspective on how to judge whether [or not] our

design is good," says Koyo. While there was little explicit mention of more-than-human theory that we read, there was enthusiasm around theory in general. Koyo even suggested that we did not have *enough* theory in the spring course; this is, in our experience, an uncommon point of view, however. Mojin, a MS student in Human Centered Design & Engineering noted that the Post(-)Human Hazmat DRG in 2020 followed on the heels of a required theory course for her degree, which concluded with the theme of posthumanism. Following up on this topic was one of the primary reasons Mojin chose to register for this course. While we are not sure if our modules on more-than-human theories were completely successful, we are convinced that students benefit from the integration of rigorous theory when designing speculatively. It may be that these students, who self-select to join these DRGs, are more likely to engage with theory.

Climate change was clearly a meaningful theme for our students. Multiple students report that it was important for them to find a perspective that they could focus on as designers, to find their place in working on climate change. Similarly, finding peers who were also interested in this topic was validating. They also noted that offering climate-focused courses through the department was important to them. It is clear that as educators we need to recognize our power in designing education. Our curricular decisions offer hope, direction, and validation in concern with intractable, wicked problems like climate change. We see our DRGs as having been successful in creating space and belonging, a community of interest, for students interested in the connections between design and climate change.

Our mantra, "make it weird" was also successful. The phrase came up in several interviews, and our students seemed to understand it as warm encouragement of their ideas. This shows that one of the best things we can do as teachers of speculative practice is to encourage designers to embrace their ideas and run with them. Strengthening individual resolve and comfort for students to "think outside the box," as one student noted, should be a goal of all design education. It would seem that our students take this perspective to heart more in the context of speculative design than typical UCD courses, which suggests that HCI education should embrace discursive design in its curriculum.

We find that there are more topics that emerged in our interviews that also resonate with students, but we are not convinced we were able to fully address them. Speculative design as a field is strongly critiqued for being too western and too white. We agree that this is a problem, and not just for speculative design. One interviewee mentioned that speculative design helped them to not simply design for themselves, especially in the face of climate change. Another student noted that speculative design is a process of interpretation, and that considering it as a form of co-design, or conversation, to which you invite the audience to participate. These are potential opportunities of speculative design to "tell new stories" in new ways, to new audiences.

Though rich in potential, this is an area of growth for us as educators. We seek new examples, readings, and perspectives in, on, and through speculative design as a practice. If, as we believe, teaching speculative design is a way to develop designers and to advance design education, then we need to incorporate speculation from many different perspectives. To do this well, we see some opportunities for shifting our approach to teaching.

One of these is to explore longer thematic courses, which is a challenge in our quarter-based system (10-week long instructional periods in autumn, winter, and spring). One of our interviewees noted that our required theory course in the master's program ended with readings on posthumanism and more-than-human design. This inspired them to join the autumn course, immediately following their theory course. Another student was able to incorporate a VSD workshop in their capstone, incorporating values into their project. This shows us that there is an opportunity to think about multiple-term offerings that allow students to explore the topics more in-depth. Teaching speculative design in 10 weeks is difficult, and we think that with curricular creativity we could do much more.

We also see that our approach can also be abstract. Our pathways through speculative design avoid linear approaches that are often core to teaching UCD approaches. Our students reported this as a strength of our classes, stating that it helped them develop as designers helping them be less reliant on such linear structures. They also report that it is challenging. We have seen how this can be stressful, sometimes causing creative blocks for some students. Our attempts to help scaffold the process through the approach of specific designers, such as the Auger example above, provided a great opportunity for discussion and ideation, but we are not convinced that it helped students understand designing speculatively.

Based on our student interviews, and working with them through our courses, we believe that speculative design has much to offer HCI and human/user-centered design education. Of course, our courses only included a handful of our students and required attention and focus from the instructors to thoughtfully build community and individual projects. However, with such a small number of students, the question of scale remains. How do we do this in larger courses? Similarly, sequencing the courses are also important. Students will likely benefit the most when they already have some experience in designing and have solid footing in design theory and practice. At the same time, developing their comfort of 'making it weird,' understanding of values, and skepticism of design's capitalist thinking could be critically important at earlier stages of education. These are, from our perspective, open questions.

There are other drawbacks to our approach and the structure of a 10-week system. We recognize our own reliance on more-than-human theorists and speculative designers with whom we are already familiar. While we rely on a strong contingent of feminist theorists (Haraway, Galloway, Tsing, Forlano, and others), we recognize that our two classes lacked Indigenous and First Nations authors. Similarly, our exemplars from the design world tend to come from a western perspective. One of our underlying goals of courses like this is to encourage our students to find their own voice. We recognize that for us to be able to achieve this, incorporation of more voices in our chosen readings and design examples must include more voices from BIPOC, LGBTQ+, and trans authors and makers. Especially in the context of climate change, we must increase a global perspective, pushing beyond a western-academic perspective. To do so with confidence and an assurance of ethical representation in a short amount of time is a challenge any educator can appreciate.

While our class reading lists did not include many BIPOC and First Nations authors, our work and the design of these classes are deeply motivated by works from authors such as: Zakiyyah Iman Jackson, Ihudiya Finda Ogbonnaya-Ogburu, Adrienne Brown, Robin Wall Kimmerer, Megan Bang, Sasha Costanza-Chock. Due

to the time constraints of a 10-week quarter, and that these authors are not focusing specifically on speculative design, we chose not to utilize these in our core readings.

5 Conclusion

In this paper we have outlined our approach to teaching value sensitive speculative design in HCI. By combining more-than-human concepts, VSD methods, with discursive and speculative design approaches, we seek to address shortcomings of typical user-centric HCI pedagogy. Additionally, we see climate change not only as the critical challenge to contemporary life, but also the perfect topic through which to consider an entangled world of more-than-human actors, factors, and temporalities. Using speculative and discursive design is certainly not the only avenue to addressing wicked problems such as climate change. However, given the increasing complexity of issues in HCI and the opportunities available through pedagogical moments, our aim is to reinvigorate and expand the designer mindset of students who plan to pursue employment in the technology design space with tools to (re-)imagine how values and ethics are enfolded in the design processes and beyond.

We passionately believe that our design students have the capacity to create greater impact in the world as they move into industry. We provided examples of how the use of VSD and speculative and discursive methods can be coupled together to provide scaffolding and a bridge to pair with user-centered design. We hope that the key insights and challenges found from the student's experience can inspire more inclusion of speculative practice and can lead to better designs and more thoughtful designers. Issues of climate change are vast and daunting, but we see this as a potential step forward in reshaping HCI pedagogy.

There are many paths for future work in this area and with our courses. There is still plenty of work to be done to close the gap between theory and practice, and how to make those connections. And more specifically, on how one does speculative design within an HCI context and pedagogy. While we have not solved the translation issues yet, we do think that speculative design furthers design student's abilities to work within these tensions and imagine futures otherwise.

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