Challenges in Teaching More-Than-Human Perspectives in Human-Computer Interaction Education

Tilde Bekker
Eindhoven University of Technology
The Netherlands
m.m.bekker@tue.nl

Eva Eriksson
Aarhus University
Denmark
evae@cc.au.dk

Simon Skov Fougt
Aarhus University
Denmark
sifo@edu.au.dk

Anne-Marie Hansen
Malmö University
Sweden
anne-marie.hansen@mau.se

Elisabet M. Nilsson
Malmö University
Sweden
elisabet.nilsson@mau.se

Daisy Yoo
Eindhoven University of Technology
The Netherlands
d.yoo@tue.nl

ABSTRACT

In this paper, we discuss challenges emerging in connection to teaching for and with more-than-human values and stakeholder perspectives in human-computer interaction (HCI) curriculum. Recently, we have experienced a rise in interest in more-than-human perspectives in various HCI venues. However, there is still a lack of published work on how to teach such perspectives, as well as practical educational resources for supporting the more-than-human HCI in education.

CCS CONCEPTS

• **Human-centered computing → HCI theory, concepts and models**.

KEYWORDS

HCI, more-than-human, values

ACM Reference Format:
Tilde Bekker, Eva Eriksson, Simon Skov Fougt, Anne-Marie Hansen, Elisabet M. Nilsson, and Daisy Yoo. 2023. Challenges in Teaching More-Than-Human Perspectives in Human-Computer Interaction Education . In *EduCHI 2023: 5th Annual Symposium on HCI Education (EduCHI '23), April 28, 2023, Hamburg, Germany*. ACM, New York, NY, USA, 4 pages. https://doi.org/10.1145/3587399.3587406

Figure 1: A first-year master student's understanding of "what is design?" before (left) and after (right) five hours of teaching an introductory design course at the experience economy program. How would a similar sketch look after teaching for more-than-human perspectives in HCI? Can it be used for assessing the students understanding?

1 INTRODUCTION

Recently in the field of human-computer interaction (HCI), we are seeing a growing body of work engaging with more-than-human values and perspectives, e.g., [6, 15, 19, 20, 24, 26, 42]. On the one hand, we are confronted with dire socio-ecological challenges such as climate change, species extinction, and energy crisis. On the other hand, our everyday is becoming increasingly entangled with sensors, devices, and networks. Such trends call for a shift from human-centred design thinking to integrating more-than-human perspectives in HCI, which requires a continuous process of increasing awareness also in education [30]. Students can learn how to better engage with living forms (e.g., animals, plants, fungi, algae), intelligent systems (e.g., conversational agents, internet of things), and natural cultural heritage (e.g., rivers, mountains, buildings, monuments) [6, 18] in their design processes, not only as resources [31], but to embrace them as actors and stakeholders with which we are intimately entangled and share the world [22]. Frauenberger points to different theoretical approaches as a grounding for working with what he calls the next wave of HCI "Entanglement HCI" [15] including Actor-Network Theory (ANT) e.g. [27], Object-Oriented Ontology (OOO) e.g. [23], post-phenomenology e.g. [25, 40] and Agential Realism e.g. [3, 4]. Spies and Alff draw from assemblage theory by Deleuze and Guattari [10] and the notion of self-organization and adaptability that can serve as inspiration for the development of socio-natural entanglements [35]. They also bring up DeLanda's conceptions of relationality in relation to how empirical research can be performed in a project [8, 9]. These approaches all offer opportunities to think differently about the design and development of HCI. However, research and pedagogy do not always move at the same speed; questions of how to teach more-than-human values and perspectives in HCI education remain open [5]. The conceptual complexity that arises when thinking in assemblages of humans and non-humans might be challenging for students who are used to focusing on simplistic user-technology relationships.

EduCHI '23, April 28, 2023, Hamburg, Germany

ACM ISBN 979-8-4007-0737-7/23/04.
https://doi.org/10.1145/3587399.3587406

1.1 More-than-Human Perspectives in HCI

We have identified at least three themes as relevant in relation to more-than-human perspectives in HCI.

1.1.1 More-than-Human Species. In the LIMITS conference series [1], critical discussions about the impacts of new technologies and the unrealistic uses of resources that new technologies cause are heavily debated. A more-than-human approach to development of HCI will shift the attention away from what is possible to what is responsible for the planetary well-being. More-than-human approaches to HCI can foster accountability towards life forms that goes beyond human flourishing. How can we learn to listen to the voices and values of more-than-human species and nature? How can we support the well-being of the entire planet without necessarily prioritizing one species over the others?

1.1.2 More-than-Human Things. The term more-than-human also includes *things* beyond living species, and in particular, for the interest of the HCI community are computational things such as robots, AI agents, sensors, devices and digital platforms. These *things* challenge the notion of products being "industrial artefacts" to "fluid assemblages," which are networked, dynamic and with constantly evolving forms and functions depending upon context [32]. How can we understand the nature of these things, take account for such multi-faceted, fluid and rapidly developing forms and functions and the challenges these new forms of nonhumans imply?

1.1.3 More-than-Human Designers. We need to conceptually equip our design theory, concepts, and methodologies for new alignments, move past the blind spots of human-centered design, and address the expanding universe of algorithms, forms of intelligence, and forms of life that are entering design practice, casting them as partners in a more-than-human design practice [19]. What happens when technologies are not just materials but participants in design? To what extent can nonhuman actors exercise agency in the design process?

1.2 More-than-Human Education in HCI and Art

As we embrace multiplicity and diversity in design by including more-than-human perspectives, acknowledging our deep entanglements with the world [41], it not only directs us toward new future research paths, but also leads us to question what to teach the designers of tomorrow and how we might change the HCI curriculum [20]. How can we educate responsible designers with regards to more-than-human perspectives, values, and ethics in HCI?

In this section, first, we offer a brief summary of a few existing works on more-than-human HCI and design education. Next, we introduce relevant projects from the Arts for inspiration. The search is by no means exhaustive.

1.2.1 More-than-Human Education in HCI. Beach and Fox at the University of Washington in Seattle seek to address shortcomings of typical user-centric HCI pedagogy [5]. In their reported teaching, they turned to Donna Haraway [22] and Anna Tsing [39] as they provide a more-than-human-centered approach to addressing issues of climate change, highlighting the entangled relations of humans and nonhumans that such an approach requires [5]. Specifically, Beach and Fox developed a Value Sensitive Speculative Design (VSSD). Building on the Value Sensitive Design framework [17], they 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.

Hansen et al. present the initial steps towards the development of a pedagogical framework on teaching for more-than-human values in design [20]. Their motivation is to extend existing value-based design approaches such as value sensitive design [17], which is primarily focused on human values. Also, and similar to [5], they want to challenge the traditional human-centred approach currently taught in HCI programs. The authors describe their strategy for future work to map out the research landscape in more-than-human HCI, and develop a pedagogical framework based on such research. However, there is no reporting in the paper of any suggested or concrete teaching practices so far.

Zamansky et al. report on their experiences from designing and teaching a course in Animal-Computer Interaction (ACI) to computing students at the University of Haifa [44]. The students were introduced to concepts and ideas from the fields of animal science, animal welfare, engineering and design, including stakeholder theory and extensions to nonhuman stakeholders, requirement elicitation techniques and their suitability for nonhuman users. The course was built up around a student project, and lectures addressing topics such as, Building only what they want and need; The otherness of animals; Animals as stakeholders in the design process; Learnability of systems and learning of animals; and Interaction and play addressing the design of interactions between animals and technology. Zamansky et al. suggest possible directions for teaching and research in ACI and argue that such teaching would ground more clearly the need and value of professionals and researchers with a technological background becoming involved in ACI development.

1.2.2 More-than-Human Education in Art disciplines. In the arts, there are multiplicity of projects and approaches that could be relevant for exploring how to teach for more-than-human values and perspectives in HCI. Fredriksen and Groth give examples of how artistic approaches to the more-than-human can serve as an effective pedagogical approach [16]. One such example is the online seminar series *The World is full of Monster* organized by the University of the Arts, Bremen. Through the lens of posthumanism, the seminars explored technological futures, more-than-human relations, and social and environmental justice [29]. Guests from the fields of disability studies, critical animal studies, critical plant studies, and new materialism were invited to reflect upon ways of being-in-the-world and imagine or critically engage with utopian alternatives to anthropocentrism. Fictional characters, fabulous beings, and monstrosities were used to illustrate senses of being hybrid, connected, and fluid in a world that keeps insisting on binaries. Another example is the art exhibition *More-than-humans* at The Museo Nacional Thyssen-Bornemisza that builds on speculative interdisciplinary research, multispecies ecologies and collaborations with spiders [38]. The exhibition invited visitors to explore

relationships between human and nonhuman technologies, artificial intelligence, the collective minds of animals and culture in the Anthropocene.

2 CHALLENGES OF TEACHING MORE-THAN-HUMAN PERSPECTIVES IN HCI EDUCATION

When teaching students to work with more-than-human values and perspectives in HCI, both teachers and students need support in grappling with complex, entangled challenges and dilemmas.

2.1 Representation

One challenge is to find out who might speak on behalf of whom in a project with more-than-human stakeholders. A nonhuman stakeholder might not be able to speak for themselves. If the nonhuman stakeholder is a river or a forest, how can a student include the voice of this stakeholder in their design process? What are the ethics behind finding the "right" voice to represent something? Could the student, for example, in the case of listening to the voice of a river, ask an indigenous population living in the area of the river? There is a lot of educational material offered by Indigenous scholars that can inform students about how we might relate to elements of nature in our environment [28, 33, 34]. Or should students pay attention to live stream data that represent the condition of the river? In the case of collaborating with an AI system, how might students find out what is the thought process behind this AI system? Would they need to talk to the developers of that system for its ethical reasoning? As argued by Svensson [36], it is clear that "mathemagicians" – that is, 20-35 year old white men, who develop most technologies are referred to – might not have enough ethical education to understand the issues of voice and representation in implementing AI systems.

2.2 Inclusion

Another challenge is inclusion: Why is it important to include other species and things as stakeholders in a design process? What role should the more-than-human play? How can students make sure to include all the relevant perspectives – including the more-than-human? Here the challenge for students is to explain the underlying rationale for the inclusion and exclusion of multiple stakeholders. The politics of inclusion is discussed in Tarcan et al., and Foth and Caldwell give an example that illustrates the wide spectrum of entities that might possibly be included in media architecture [14]. Furthermore, Akama et al. suggest that designers – and in this case teachers who educate students – need to make themselves accessible to new ways of seeing (this includes multiple worldviews) and practicing design [2].

2.3 Human and nonhuman designers

There is a challenge of positioning the designer into the picture of human and more-than human stakeholders. What role does the designer have? If the designer is a nonhuman (e.g., an AI agent or an animal), how might this influence the design process? The judgement of the designer may be less obvious and thus, ethical questions come into play: Who is then responsible for the outcome of a process? Culén and Karahasanovic argue that responsible education and innovation could be a way forward [7]. They list an array of approaches that should be included in design education that help designers position themselves and influence a process such as ontological design (designs bring about certain ways of being, knowing and doing), ecological thinking and systems thinking (more holistic perspectives on new technologies), and future-oriented design (thinking of long-term consequences).

2.4 Outcome and effects

Students need to reflect upon the intended outcomes and effects of the work on more-than-human oriented projects. However, there are few academic examples of how to assess whether students know how to deal with values in interaction design or whether they have become more ethically responsible [11]. Figure 1 gives an example of a simple reflection exercise on what design is by students before and after teaching design theory, but could the same method be used for more-than-human design teaching? What are the success criteria for working on a project with more-than-human players? Who/what should benefit from the outcome of the project? And who defines what is successful or not? Is it the students, or the non-human players or some third entity who can speak on behalf of?

2.5 Role of technology

Technology in and of itself might be over-representing human perspectives because it is created by humans. The discussion about if/how/when technologies are necessary, or whether it is more fruitful to develop tools with no technologies involved should be opened up to students. For example, in a permaculture practice, all farming can be done through manual approaches, but robotics technologies might reduce the manual workload without compromising the permaculture principles learned from interacting with more-than-human players. For example, Hansen discusses kind(s) of technologies that can be implemented in a Permaculture community where some community members resisted technology [21]. More critical articles about the use of technologies found in the LIMITS conference series might serve as inspirational material for teachers.

2.6 Bias

Furthermore, technologies are often biased toward western thinking, and the hegemony of modernist paradigms is criticized in [12, 13] for being too focused on human-centric utilitarian perspectives that undervalue more-than-human perspectives. A dilemma arises when students inquire for non-western perspectives, in particular if students from the west/global north attempt to bring in perspectives from other cultures that are more aligned with a more-than-human ecological worldview. The students might encounter issues of cultural appropriation and de-contextualization. For example, if students want to make use of the principle of "relational accountability" [43] in working with more-than-human beings and things in their design process, how can we teach them to do justice to apply such principle?

3 CONCLUSION

The above-listed dilemmas and questions are a few examples of challenges that teachers and students need to address when engaging with more-than-human perspectives and values in HCI education. We invite a debate about these challenges and call the HCI community to bring more questions and dilemmas to the table. It is the hope of the authors that the community will work together to develop HCI curricula to support students in growing into responsible designers equipped to handle the complexities of including more-than-human perspectives and values in their work.

ACKNOWLEDGMENTS

The research is co-funded by Erasmus+ programme of the European Union, Grant number 2022-1-SE01-KA220-HED-000086664.

REFERENCES

[1] 2022. *Limits 2022 - Eighth Workshop on Computing within Limits.* Retrieved Dec 1, 2022 from https://computingwithinlimits.org/2022/

[2] Yoko Akama, Ann Light, and Takahito Kamihira. 2020. Expanding Participation to Design with More-Than-Human Concerns. In *Proceedings of the 16th Participatory Design Conference 2020 - Participation(s) Otherwise - Volume 1* (Manizales, Colombia) *(PDC '20)*. Association for Computing Machinery, New York, NY, USA, 1–11. https://doi.org/10.1145/3385010.3385016

[3] Karen Barad. 2003. Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter. *Signs: Journal of Women in Culture and Society* 28, 3 (March 2003), 801–831. https://doi.org/10.1086/345321

[4] Karen Barad. 2007. *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning.* duke university Press.

[5] Michael W. Beach and Tyler Fox. 2021. Value Sensitive Speculative Design: Exploring More-Than-Human Relations in the Age of Climate Catastrophe. *Interaction Design and Architecture(s)* 51 (Dec. 2021), 111–131. https://doi.org/10.55612/s-5002-051-005

[6] Aykut Coskun, Nazli Cila, Iohanna Nicenboim, Christopher Frauenberger, Ron Wakkary, Marc Hassenzahl, Clara Mancini, Elisa Giaccardi, and Laura Forlano. 2022. More-than-Human Concepts, Methodologies, and Practices in HCI. In *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI EA '22)*. Association for Computing Machinery, New York, NY, USA, Article 150, 5 pages. https://doi.org/10.1145/3491101.3516503

[7] Alma Leora Culén and Amela Karahasanovic. 2022. Towards responsible interaction design education. In *Proceedings of DRS*. Design Research Society. https://doi.org/10.21606/drs.2022.465

[8] Manuel DeLanda. 2006. A new philosophy of society: assemblage theory and social complexity (New York: Continuum). (2006).

[9] Manuel DeLanda. 2016. *Assemblage theory.* Edinburgh University Press.

[10] Gilles Deleuze and Félix Guattari. 1987. A housand Plateaus: Capitalism and Schizophrenia. *Trans. Brian Massumi. Minneapolis: U of Minnesota P* (1987).

[11] Eva Eriksson, Anne Linda Kok, Wolmet Barendregt, Camilla Gyldendahl Jensen, and Elisabet M. Nilsson. 2022. Teaching for Values in Interaction Design: A Discussion About Assessment. *Interaction Design and Architecture(s)* 52 (June 2022), 221–233. https://doi.org/10.55612/s-5002-052-012

[12] Arturo Escobar. 2018. *Designs for the pluriverse.* Duke University Press, Durham, NC.

[13] Arturo Escobar. 2020. *Pluriversal politics.* Duke University Press, Durham, NC.

[14] Marcus Foth and Glenda Amayo Caldwell. 2018. More-than-Human Media Architecture. In *Proceedings of the 4th Media Architecture Biennale Conference* (Beijing, China) *(MAB18)*. Association for Computing Machinery, New York, NY, USA, 66–75. https://doi.org/10.1145/3284389.3284495

[15] Christopher Frauenberger. 2019. Entanglement HCI The Next Wave? *ACM Trans. Comput.-Hum. Interact.* 27, 1, Article 2 (nov 2019), 27 pages. https://doi.org/10.1145/3364998

[16] B.C. Fredriksen and C. Groth. 2022. *Expanding Environmental Awareness in Education Through the Arts: Crafting-with the Environment.* Springer Nature Singapore. https://books.google.dk/books?id=kFU3zwEACAAJ

[17] Batya Friedman and David G Hendry. 2019. *Value sensitive design.* MIT Press, London, England.

[18] Elisa Giaccardi and Elisa Giaccardi. 2020. Casting things as partners in design: towards a more-than-human design practice. *Relating to things: design, technology and the artificial. Bloomsbury, London* (2020), 99–132.

[19] Elisa Giaccardi and Johan Redström. 2020. Technology and More-Than-Human Design. *Design Issues* 36, 4 (Sept. 2020), 33–44. https://doi.org/10.1162/desi_a_00612

[20] Anne-Marie S. Hansen, Elisabet M. Nilsson, Eva Eriksson, Daisy Yoo, and Rikke Toft Nørgård. 2022. Teaching for more-than-human perspectives in technology design – towards a pedagogical framework. https://cumulusdetroit2022.org/ null ; Conference date: 02-11-2022 Through 04-11-2022.

[21] Anne-Marie S. Hansen. 2020. The App Is Not Where the Action Is: Discussing Features of an Internal Communication System for a Permaculture Village. In *Proceedings of the 7th International Conference on ICT for Sustainability* (Bristol, United Kingdom) *(ICT4S2020)*. Association for Computing Machinery, New York, NY, USA, 275–284. https://doi.org/10.1145/3401335.3401824

[22] Donna Jeanne Haraway. 2016. *Staying with the trouble: Making kin in the chthulucene.* Duke University Press.

[23] Graham Harman. 2015. Object-Oriented Ontology. In *The Palgrave Handbook of Posthumanism in Film and Television.* Palgrave Macmillan UK, 401–409. https://doi.org/10.1057/9781137430328_40

[24] Sarah Homewood, Marika Hedemyr, Maja Fagerberg Ranten, and Susan Kozel. 2021. Tracing Conceptions of the Body in HCI: From User to More-Than-Human. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 258, 12 pages. https://doi.org/10.1145/3411764.3445656

[25] Don Ihde. 1990. Technology and the lifeworld: From garden to earth. (1990).

[26] Petra Jääskeläinen, André Holzapfel, and Cecilia Åsberg. 2022. Exploring More-than-Human Caring in Creative-Ai Interactions. In *Nordic Human-Computer Interaction Conference* (Aarhus, Denmark) *(NordiCHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 79, 7 pages. https://doi.org/10.1145/3546155.3547278

[27] Bruno Latour. 1996. On actor-network theory: A few clarifications. *Soziale welt* (1996), 369–381.

[28] Elizabeth Ann McKinley and Linda Tuhiwai Smith (Eds.). 2019. *Handbook of Indigenous Education.* Springer Singapore. https://doi.org/10.1007/978-981-10-3899-0

[29] Johanna Mehl. 2022. *The world is full of monsters.* Retrieved Feb 10, 2022 from https://designandposthumanism.org/2022/09/26/the-world-is-full-of-monster

[30] Greg Nijs, Giulietta Laki, Rafaella Houlstan, Guillaume Slizewicz, and Thomas Laureyssens. 2020. Fostering More-than-Human Imaginaries: Introducing DIY Speculative Fabulation in Civic HCI. In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society* (Tallinn, Estonia) *(NordiCHI '20)*. Association for Computing Machinery, New York, NY, USA, Article 36, 12 pages. https://doi.org/10.1145/3419249.3420147

[31] Anton Poikolainen Rosén, Maria Normark, and Mikael Wiberg. 2022. Towards More-than-Human-Centred Design: Learning from Gardening. *International Journal of Design* (2022).

[32] Johan Redström and Heather Wiltse. 2018. *Changing things: The future of objects in a digital world.* Bloomsbury Publishing.

[33] Linda Tuhiwai Smith. 2021. *Decolonizing methodologies* (3 ed.). Zed Books, London, England.

[34] Linda Tuhiwai Smith, Eve Tuck, and K Wayne Yang (Eds.). 2018. *Indigenous and decolonizing studies in education.* Routledge, London, England.

[35] Michael Spies and Henryk Alff. 2020. Assemblages and complex adaptive systems: A conceptual crossroads for integrative research? *Geography Compass* 14, 10 (June 2020). https://doi.org/10.1111/gec3.12534

[36] Jakob Svensson. 2021. Wizards of the Web.

[37] Berilsu Tarcan, Ida Nilstad Pettersen, and Ferne Edwards. 2022. Making-with the environment through more-than-human design. (2022).

[38] Museo Nacional Thyssen-Bornemisza and Thyssen-Bornemisza Art Contemporary. 2019. *More-than-humans.* Retrieved Feb 10, 2022 from https://studiotomassaraceno.org/more-than-humans/

[39] Anna Tsing. 2013. *More-than-human sociality: a call for critical description.* Routledge, 27–42.

[40] Peter-Paul Verbeek. 2005. *What things do: Philosophical reflections on technology, agency, and design.* Penn State Press.

[41] Ron Wakkary. 2020. Nomadic practices: A posthuman theory for knowing design. *International Journal of Design* 14, 3 (2020), 117.

[42] Ron Wakkary. 2021. *Things we could design: For more than human-centered worlds.* MIT press.

[43] Shawn Wilson. 2008. *Research is ceremony - indigenous research methods.* Fernwood Publishing, Black Point, NS, Canada.

[44] Anna Zamansky, Dirk van der Linden, and Sofya Baskin. 2017. Teaching Animal-Computer Interaction: An Experience Report. In *Proceedings of the Fourth International Conference on Animal-Computer Interaction* (Milton Keynes, United Kingdom) *(ACI2017)*. Association for Computing Machinery, New York, NY, USA, Article 4, 7 pages. https://doi.org/10.1145/3152130.3152136