

Teaching Practices on More-than-human Perspectives in HCI Education – Current State and Future Paths

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Abstract: In times of climate emergency and artificial intelligence affecting everything in life, we must reconsider the way we teach our students how to become responsible designers of future technologies. In recent years we have seen a rise in interest in more-than-human perspectives in human-computer interaction (HCI), where more-than-human things, species, and designers move the field beyond traditional human-centred approaches. In this paper, we set out to explore how this new approach is taught, what we can learn from it, and what challenges remain. The contribution of this paper is an overview of a selection of more-than-human teaching practices and curriculum in higher education, and some suggestions of future paths.

Keywords: *More-than-human; human-computer interaction; HCI; Interaction design; teaching*

Introduction

Today, we are confronted with dire socio-ecological challenges such as climate emergency, species extinction, and energy crisis. Also, our every day is becoming increasingly entangled with sensors, devices, and networks. This calls for a shift, where we are departing from human-centred thinking, towards a more-than-human worldview, which requires a continuous process of increasing awareness through education (Nijs, Laki, Houlstan, Slizewicz, & Laureyssens, 2020). In various research venues, we see a rise in the number of research publications taking more-than-human perspectives in interaction design and human-computer interaction (HCI) (Behzad, Wakkary, Oogies, Zhong, & Lin, 2022; Coskun et al., 2022; Dolejšová, Wilde, Bertran, & Davis, 2020; French, Mancini, & Sharp, 2020; Heitlinger, Houston, Taylor, & Catlow, 2021; Homewood, Hedemyr, Fagerberg, & Kozel, 2021; Jääskeläinen, Holzapfel, & Åsberg, 2022; Wolff et al., 2021; Yoo, et al., 2023).



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However, research and pedagogy do not always emerge at the same rate; questions of *how* to teach this remain (Beach & Fox, 2022). While, so far, there is little discussion on how to teach more-than-human perspectives to make students responsible designers of future technologies, we are seeing a rising demand for such education (e.g., Bekker et al., 2023; Beach & Fox, 2022; Hansen, Nilsson, Eriksson, Yoo, & Nørgård, 2022; Nijs, Laki, Houlstan, Slizewicz, & Laureyssens, 2020). We also see an increasing interest in discussing the interaction design curricula in general, and how to teach various aspects of HCI (e.g., Christiansson, Grönvall, & Yndigejn, 2018; Eriksson, Nilsson, Hansen, & Bekker, 2022; Churchill, 2013)

This paper presents an overview of a selection of more-than-human teaching practices and curricula in technology design programmes in higher education. The selection does not provide a complete overview of existing educational initiatives but presents examples that could illustrate how more-than-human perspectives can be addressed in HCI education. The examples were identified by running searches on the internet and in dialogue with representatives from the design research community.

The selection includes courses on bachelor's and master's levels in higher education, but also advanced level courses targeting doctoral students and design professionals. The courses address design in relation to study, design for, and design with other-than-human stakeholders in HCI, such as living forms (e.g., animals, plants, fungi, algae), intelligent systems (e.g., AI, conversational agents, internet of things), and natural cultural heritage (e.g., rivers, mountains, buildings, monuments). An overview and brief descriptions of the courses included are presented in Tables 1 and 2, and thereafter discussed. The paper concludes with some suggestions of future paths.

Method

To discover information about teaching practices on more-than-human, we combined three approaches: 1) searching for peer-reviewed papers about more-than-human teaching practices (in the SCOPUS database) and 2) searching for more-than-human courses through Google search engine to find descriptions of the relevant courses and 3) searching in dialogue with colleagues in the design research community, hoping to find information about more-than-human related courses themselves.

Search query in SCOPUS included:

- educ* AND More-than-human AND HCI
- teach* AND more-than-human AND HCI

The SCOPUS searches returned the following results:

- Bekker et al. (2023). Challenges in Teaching More-Than-Human Perspectives in Human-Computer Interaction Education.
- Yoo et al. (2023). More-Than-Human Perspectives and Values in Human-Computer Interaction.
- Beach and Fox (2022). Value Sensitive Speculative Design: Exploring More-Than-Human Relations in the Age of Climate Catastrophe.
- Nijs et al. (2020). Fostering More-than-Human Imaginaries: Introducing DIY Speculative Fabulation in Civic HCI.

In addition, the “snowball” technique (Bryman et al., 2022) was applied on the references within identified publications, which gave one additional result:

- Hansen et al. (2022). Teaching for more-than-human perspectives in technology design – towards a pedagogical framework.

The searches using Google or in dialogue with peers in the design research community provided the courses listed in Table 1 and Table 2.

The selection of teaching practices included in the overview should not be seen a complete screening of the field, but as a selective representation based the results for the searches and that our peers perceive as representing the state-of-the-art of the field. For instance, we acknowledge that there are many other notions used for design of technology such as e.g., interaction design, and that the more-than-human perspective can be found in many fields outside of HCI (e.g., Science and technology studies (STS)). A further limitation is that much information about university courses are hidden behind learning management systems, and not accessible by external people. As such, this paper comes with a number of limitations, which makes the results inspiring rather than scoping.

Results

The results from our searches show that there is a variety of educational initiatives addressing more-than-human perspectives out there, but also that it is still quite uncommon. There are only very few research articles published in the field, despite an increased interest in the topic of more-than-human in the design research community. The examples of courses and programs included in the overview are divided into bachelor's level courses (Table 1) and master's level (Table 2) courses.

Table 1. A selection of bachelor's level courses addressing MTH perspectives.

BACHELOR'S LEVEL
<p>Design for the Posthuman Era (3 ECTS) School of Arts, Department of Art, Aalto University (FIN) (Aalto University, 2022)</p> <p>Themes: – Posthumanism, transhumanism, systems thinking, design thinking methods</p> <p>Learning objectives: By partaking in the course, the students are expected to – Become familiar with the philosophy of posthumanism – Discuss the future role of the human, while considering also the nonhuman actors in a geopolitical, but also in an eco-philosophical manner – Develop an understanding of theoretical frameworks focused on the relation between technology and humans, and their implications for the design of technology – Get acquainted with design thinking methods that foster creativity and alternative thinking – Critically reflect on the challenges and opportunities associated with the design of future technology – Gain a first-hand experience of technology design process – Collaborate with others in order to solve a transdisciplinary design project</p> <p>Teaching activities: – Lectures (16 h), individual work (10 h), group work (45 h), reflection (10 h)</p> <p>Assessment: – Participation in the course, group project and an individual learning portfolio inspired by self-ethnography methods</p>
<p>Animal-Computer interaction – Computer science, information systems, University of Haifa (IL) (Zamansky, van der Linden, & Baskin, 2017)</p> <p>Themes: – Animal science, animal welfare, engineering and design (stakeholder theory and extensions to non-human stakeholders, requirement elicitation techniques and their suitability for non-human users, agile development cycle and iterative prototyping, user-centric and participatory design, usability and its dimensions, user experience)</p> <p>Learning objectives: No information available</p> <p>Teaching activities: – Weekly seminars structured as: Students presenting selected ACI literature (30 mins) Lecture on relevant topic (1 hour) Discussion (30 min)</p> <p>Assessment: – Presentation of ACI papers in class, participation in discussions, and final projects</p>
<p>BioFabLab – Experimental learning and research facility, Roskilde University (DK) (Roskilde University, 2023)</p> <p>Themes: – Introduction to biology and ecology, Opensource hardware for science and labs, Biodesign and ecosystem design principles that support design or creative processes across disciplines, "How to grow everything", Citizen Science/DIY Research</p> <p>Teaching activities: – Supervision and support when working in the lab</p> <p>Assessment: No information available</p>

Table 2. A selection of master's level courses addressing MTH perspectives.

MASTER'S LEVEL
<p>Fundamentals of More-than-Human Design (3 ECTS) – Industrial Design Engineering, Delft University of Technology (NL) (Delft University of Technology (2023:1)</p> <p>Themes: – Decentering the human (more-than-human perspectives and trajectories) – Problematizing the design space (more-than-human frames and speculations) – Imagining otherwise (more-than-human agency and co-performances)</p> <p>Learning objectives: After completing the course, students will be able to – Discuss and critically evaluate readings and projects concerning theoretical, methodological, and practical aspects of more-than-human design – Identify and contextualise key concepts, methodologies, and practices related to more-than-human design and give concrete examples – Develop and motivate proposals in the context of more-than-human design through a reflexive and speculative approach that takes account of the profile of the student</p>

<p>Teaching activities: – Lectures, seminar discussions, speculative design activities</p> <p>Assessment: – Course report</p>
<p>More-than-Human Design Experiments (6 ECTS) – Industrial Design Engineering, Delft University of Technology (NL) (Delft University of Technology (2023:2)</p> <p>Themes: – Decentering the human (more-than-human perspectives and trajectories) – Problematizing the design space (more-than-human frames and speculations) – Imagining otherwise (more-than-human co-performance and agency)</p> <p>Learning objectives: After completing the course, students will be able to – Discuss contemporary more-than-human design projects in terms of their effects and potential impact – Experiment with how to do research, design, and prototype for more-than-human worlds – Motivate their design proposals from a more-than-human design perspective</p> <p>Teaching activities: – Lectures. Workshops, individual design experiments</p> <p>Assessment: – Course report</p>
<p>Design and the Posthumanist Perspective (15 ECTS) – Academy of Design and Crafts, University of Gothenburg (SWE) (University of Gothenburg (2023)</p> <p>Themes: – Posthumanism, environmental sustainability, environmental humanities</p> <p>Learning objectives: After completing the course, students will be able to – Account for key posthumanist concepts – Give examples of contemporary design projects where posthumanist perspectives have been applied, as well as at a general level describe methodology and result for such projects – Describe what characterises the interdisciplinary field Environmental Humanities as well as explain its relation to design and other artistic practices – Carry out and communicate an individual design project from a posthumanist perspective – Contextualise posthumanist concepts in relation to design – Reflect on how the posthumanist perspective has influenced their own project work – Critically evaluate their own work in relation to contemporary design practices – Critically discuss how a posthumanist perspective can affect issues relating to environmental sustainability</p> <p>Teaching activities: – Lectures, seminars, workshops, individual and group supervision</p> <p>Assessment: – Oral presentation of individual design projects and written assignments</p>
<p>Strategy and Design for the Anthropocene (Master program) – ESC Clermont School of Management and Strate Ecole de Design Lyon (FR), Ecole de Design Lyon (2023)</p> <p>Themes: – The Anthropocene, ecological redirection.</p> <p>Learning objectives: The students will – acquire new technical and operational skills to initiate transition policies within organisations that wish to implement change by making proactive, rapid and effective ecological redirections – be trained in the processes, methods and techniques that will enable them to design desirable futures within ecological, climatic, legal, social and political constraints – learn how to set up new forms of investigation to address unusual critical situations: accelerated changes in an ecosystem, collapse of a resource or living environment, situations of scarcity, humanitarian and social crisis, strategic crisis, forward-looking strategies etc.</p> <p>Teaching activities: – 8 months of courses and 4 to 6 months of internship – Lectures, seminars, methods for diagnosing and modelling Earth-system on micro and macro levels</p> <p>Assessment: No information available</p>
<p>AI and more-than-human design – Two-days Design Master Class for Professionals, Delft university of Technology (NL), (Delft University of Technology (2023:3)</p> <p>Themes: – More-than-human things, data, machine learning, and artificial intelligence, connected things, Digital transformation of society, responsible and sustainable digital futures</p> <p>Learning objectives: After completing the course, students will be able to – Understand the fluid and entangled nature of things in a digital world – Apply ideas of more-than-human design to expand human imagination and capabilities in creating the conditions for inclusive and sustainable digital futures – Select and devise more-than-human design tools and techniques in design practice</p> <p>Teaching activities: – Before course start a homework assignment to work on, lectures and workshops</p> <p>Assessment: No information available</p>

Research literature

As reported, five research articles were found in our searches (Bekker et al., 2023; Yoo et al., 2023; Beach & Fox, 2022; Nijs et al., 2020; Hansen et al., 2022). The first paper (Bekker et al., 2023) does not demonstrate but rather discusses challenges that merge in connection to teaching more-than-human perspectives in HCI curriculum. The identified challenges are representation, inclusion, human and non-human designers, outcomes and effects, the role of technology, and bias. Representation is to find out who might speak on behalf of whom in a project with more-than-human stakeholders. Inclusion asks why it is important to include other species and things as stakeholders in a design process. Human and non-human designers seek to position the designer into the picture of human and more-than-human stakeholders and ask what role the designer has. Outcome and effects, addresses how we can assess students in more-than-human perspectives. The role of technology asks if/how/when technologies are necessary, or whether it is more fruitful to develop tools with no technologies involved should be opened to students. Bias is about that technologies are often biased toward Western thinking, and the hegemony of modernist paradigms is criticized for being too focused on human-centric utilitarian perspectives that undervalue more-than-human perspectives. This article offers insights into key challenges that teachers and students need to address when engaging with more-than-human perspectives and values in HCI education, and although inspiring and relevant, they do not cover all questions and dilemmas that can emerge in more-than-human perspectives in HCI teaching.

The article by Yoo et al. (2023) is a description of a Special Interest Group session at a conference and is therefore somewhat different from the other papers. The session is built up around four different themes (more than human species, things, designers, and education), with corresponding questions for discussion. In terms of design education, the following questions were posed: *More than human design education* – What can we teach the designers of tomorrow? How can we educate responsible designers on more-than-human values and ethics in HCI? What has to be unlearned to change our perspectives and attitudes? However, we have not able to find any reports elaborating on the results from this special interest group.

Beach & Fox (2022) offers a description of and reflection on two courses given at the University of Washington, Seattle, as examples of Value Sensitive Speculative Design (VSSD) in HCI pedagogy in the face of climate change. Building on the Value Sensitive Design framework (Friedman & Hendry, 2019), 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.

In the fourth article, Nijs et al. (2020) examines how applying a speculative fabulation method facilitates probing, informing and engaging citizens on a variety of human and more-than-human urban issues (Nijs et al., 2020). Drawing on the theoretical backdrop from the environmental humanities, through an ethnographic account of two preliminary participatory design tracks, they describe how workshop interventions and participatory protocols were infused with embodied and material storytelling that probes towards fostering more-than-human imaginaries.

Finally, Hansen et al., (2022) introduce the idea of a pedagogical framework for more-than-human design. In this position paper, the authors present a path towards a pedagogical approach for how practices of designing for more-than-human perspectives can be turned into teaching activities in technology design education. In doing so, teachers become agents of change by creating conditions for students to grow into responsible designers of future technologies and play a role in driving adaptation towards a more sustainable future. However, the paper is rather describing a method rather than examples from practice.

Discussion

In this paper, we set out to make a brief overview of various examples of teaching more-than-human perspectives in HCI education. This means going beyond the traditional human-centred approach to design that is typically taught at universities and starting to identify and question the roles that nonhuman things, species, and intelligent systems play in design. The examples included in the overview provide an inspiration to how we can educate responsible designers with regard to more-than-human perspectives in HCI. From the results, we can see that teaching the more-than-human approach to design has a foundation in several different theoretical and philosophical approaches such as e.g., 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). Most of the examples addressed more-than-human as in considering multispecies (e.g., animals, plants) and targeted environmental issues. Few of the courses focused on more-than-humans as in things (e.g., AI, conversational agents).

We see that more-than-human perspectives are offered at both on bachelor and master levels and in both computer science departments as well as in more art-based departments, although more traditional HCI focused courses are lacking. We also see that many questions on *how* to teach this remain open (Bekker et al., 2023; Yoo et al., 2023). We are aware that the focus of this paper is on courses taught, whereas curricula can also address more-than-human education through other educational formats, such as design cases. This will be examined in more detail in future work.

One thing that characterises some course examples included in Table 1 and 2, is that the students' design outcomes are expected to apply a speculative approach. For instance, in (Delft University of Technology, 2023:1) the teaching is built up around a speculative design activity for each theme introduced in the course, where the students are expected to develop and motivate proposals in the context of more-than-human design through a reflexive and speculative approach. While (Delft University of Technology, 2023:2) take a more experimental approach to design, the students are expected to come up with a Future vision for more-than-human design.

In terms of the teaching and learning activities carried out in the classroom it appears as if most of the examples of teaching practices build on a pedagogy that is rather common in design education consisting of a combination of lectures, seminars, group work and design projects. None of the courses were given remotely. The assessments were primarily of summative kinds, consisting of assessing course reports and final projects submitted at the end of the course. Formative assessment occurred during oral presentations and seminars. In a couple of courses, the students were also assessed based on participation in the seminars. Whether ipsative and authentic assessment forms were practised is not clear.

What we have not yet examined, as this information was not provided, is whether these courses are obligatory or elective courses. It is interesting to examine further how these courses are embedded in the overall curriculum. For example, are these courses seen as providing knowledge and skills that all students should have, as early in their curriculum as possible, or is it a form of 'specialisation' intended for a sub-set of the students?

As pointed out in the introduction, what is striking is that there is much more research outputs and researchers working with more-than-human perspectives in HCI than there are dedicated courses or shared experiences from teaching this perspective. For instance, the research group More-than-human Futures (Queensland University of Technology, 2023) is dedicated to socio-ecological justice through more-than-human futures grounded in Indigenous teachings of caring for Country but shared no information about teaching. In a panel, More-than-human Concepts, Methodologies, and Practices in HCI, the educational perspective is missing (Coskun et al., 2022).

Future paths

So, what is the meaning(s) of more-than-human in HCI, a field that proudly begins with a capital H? We can see that moving beyond the human in human-computer interaction could present a paradoxical undertaking. However, our overall concern in terms of teaching for more-than-human perspectives in HCI is that 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. Here we need ways of transferring concepts, methods and practices developed in research to become accessible to students.

We therefore suggest three future paths. *Firstly*, we believe that starting with studying existing teaching practices, not only in dedicated courses as in this paper but various exercises and other teaching activities out there – start with asking colleagues for experiences. *Secondly*, we urge researchers to gather concepts, methods and practices used in research and transform these into practical hands-on teaching activities accessible to students. *Thirdly*, we believe in not only testing these teaching activities in class but also sharing them with the community as open educational resources. We must be inspired by and learn from each other. With the advancement of the third wave HCI as suggested by Bødker (2015), and with the shift toward the fourth paradigm as suggested by Frauenberger (2019), there is a growing need for finding more sustainable alternatives to human-centeredness and Anthropocentrism, and especially when teaching our students how to be responsible designers of future technologies.

Conclusion

In this paper, we have gathered a number of examples from teaching more-than-human perspectives in HCI. In line with Bekker et al. (2023), we highlight the importance of challenging the dominating paradigm of technology design practices primarily focusing on people and profit by also including planetary and more-than-human perspectives, and

alternative ways of being in the world in the future HCI curriculum. We acknowledge our intimate entanglement with computing technologies Frauenberger (2019) as well as with multiple species and their environments, where other than human beings are also considered users, designers, and stakeholders of technologies. When searching for examples to include in the overview, it became clear that there are still rather few courses and programs available that address the topic of more-than-human in design, despite the fact of intense research activities in the field. The examples included in the overview all come from Western European educational contexts, and no examples representing e.g., the Global South were encountered.

Another conclusion that can be drawn is that most courses focus on matters of sustainable design from environmental perspectives, and how to create conditions for students to become responsible designers by taking planetary perspectives into account. There are few examples of courses that focused on more-than-human things such as intelligent systems and open AI's, which are currently vividly discussed in the public debate. An example is the open letter signed by a long list of scientists, AI experts and representatives from the industry that calls all AI labs to pause the training of AI system for six months since we cannot overview where this development is heading (Future of life institute, 2023). The complexities of designing with and for more-than-humans is something that design education must address to counteract unwanted effects and consequences of technological advancements, which may become a profound risk to society and humanity. Design education can play an important role and act as a preventive power – but we first need to figure out *how*.

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