Do not believe hype: Critically discussing the role and pedagogical implication of generative AI in Human-Centred and Transdisciplinary Design Education

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**Citation**
Do Not Believe the Hype: Role and Pedagogical Implications of Generative AI in Human-Centred and Transdisciplinary Design Education

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Abstract: In this conversation paper, we discuss the implications of the emergence of generative AI tools supporting creative professional skills as tools within human-centered design and transdisciplinary education. Students’ use of generative AI in educational contexts raises excitement and societal concern about injustice and normativity, salient when working with stakeholders on societal challenges. Design educators must engage in an informed and inclusive conversation on navigating this evolving landscape together with students and educational institutions. Through the lenses of our design practices, we 1) analysed students’ behaviour during our education program; and 2) organized a focus group with students to explore their use of these tools in academic education. Based on our observations, we defined a set of themes that detail critical perspectives we could use to practice human-centered design and transdisciplinary education. Lastly, we present insights from our reflections as educators in form of autoethnography. Taking a critical stance, we debate the use of generative AI, trying to understand the impact of these tools and ways of pluralizing knowledge and practices to include, learn from, and integrate knowledge with stakeholders, humans/non-human communities. We contribute with a call for action to practice reflexivity on the challenges and opportunities of generative AI tools.

Keywords: AI; learning environment; design education; human-centred design; transdisciplinarity; biases

Introduction

The introduction of generative artificial intelligence (AI) technology raises as much excitement as concerns about its impact on pedagogies and practices of design education. Generative AI tools use input training data, machine learning, and other algorithms to generate texts, images, videos, and other media from prompts or requests (Jo, 2023). Popular
tools are large language models generating elaborate text from prompts, like ChatGPT\(^1\), or image generators from textual prompts, like Midjourney\(^2\).

As tools, Generative AI can act as creative agents in interaction with users to create text, images, videos for co-ideation/co-creation with stakeholders, all of which can be of great use in human-centred design (HCD) and transdisciplinary design education (TSD). They are also endorsed as a way to rapidly prototype designs (Demirel et al. 2023) even creating “artificial users” for human-centred evaluations of designs.

As such, generative AI tools are perceived and experienced beyond the classical tool: they are considered as socio-technical systems (Emery 2016) that generate “ontological uncertainties, epistemological diffusion and ethical conundrums” (Frauenberger 2019). With this in mind, we can consider generative AI tools as mediating our experience with others and the world around us (Verbeek 2012), and as “entangled” entities (Frauenberger 2019).

Using generative AI tools in HCD and TSD education is, thus, a confrontational experience as these tools might impact the ethos, practices, and philosophy of design. Concerning are the socio-ethical risks about perpetuation of biases, stereotypes and discrimination that the tools can bring. Generative AI tools lack the pluralistic perspective necessary to practice HCD and TSD and pose a potential risk to the participatory, pluralist, holistic, and ethically oriented ethos of these design disciplines.

Beyond ethos and ethics, here are rising concerns on the effects on teacher-student relations, potentially lowering trust between the two actors (Cotton et al., 2023) and how the tools will impact the design skills of students. Studies on the interaction with physical and digital technologies demonstrate how the learning processes differ, and some tools are more effective than others when it comes to retaining information during learning activities. When it comes to effects on teaching pedagogies and practices, different studies address the interplay between variables such as the type of technology and the teachers’ attitude towards innovation (Aldunate, Nussbaum, 2013) and the response to the factors that influence the implementation of systems and the potential obstacles for the adoption – for example – of generative AI in higher education (Ahmad, 2023; Saukkonen et al, 2021).

The emergence of free access generative AI tools (e.g., ChatGPT, Dall-E, MidJourney), promising to lower the barrier for activities such as writing and digital drawing, has raised the question of how their use will affect the learning of students at different educational level, as it happened in the past with the introduction of the electronic calculator and personal computers later, to make two examples. Reflection on this should be grounded in the reality that when directions from educational institutions are missing, students feel free to explore and adopt the technologies on their own terms. Specific tools without explaining and supporting the reasoning could foster abuse.

In this conversation paper, we critically discuss the role of intelligent agents and automated technology in the current and future practice of human-centred and transdisciplinary design education. Taking a critical stance, we debate on the use of generative AI, trying to understand the impact of these tools and ways of pluralizing knowledge and practices. Particularly, when we are training students to include, learn from and integrate knowledge with stakeholders, humans/non-human communities. To this end, we contextualize the higher educational environment in which we practice design education, the methodologies and the approaches that characterize our community of teacher and learners in the design, and the mechanics and the myths characterizing these “new” AI tools. We continue with a reflection on students’ projects in which we observed the adoption of different generative AI tools – with and without direction from the lecturers. Finally, we report insights from a focus group with industrial design engineering students, who were invited to exchange perspectives and experiences on the use of these tools in education.

Generative AI tools can be imagined as part of the toolkit and the skills we want the students to build with their university education. Therefore, we reflect on the role of teachers and how assessments might change with the adoption of these tools in practice. Finally, we introduce some open questions to the community of design educators as a call for action to practice reflexivity on the challenges and opportunities of generative AI tools.

**Human-Centred Design and Transdisciplinary Educational Context**

The educational context of this paper is the Industrial Design Engineering (IDE) bachelor and master programs at the University of Twente (the Netherlands). The four authors of the paper are specifically affiliated with the Human

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\(^1\) https://openai.com/blog/chatgpt

\(^2\) https://www.midjourney.com/home/?callbackUrl=%2Fapp%2F
Centred Design group (HCD), in which the use of a transdisciplinary approach and the involvement of stakeholders in the quality of experts of their own experience are core values in the research and teaching activities.

In the pedagogical practices adopted within the group, we facilitate the interplay of various actors in knowledge production, integrating academic and non-academic knowledge to tackle societal challenges. Fundamental in our pedagogy is to provoke reflection about the relationship between the power, sense-making, and co-shaping of academic and non-academic actors. We use transdisciplinarity (Niculescu, 2012) and citizen science as lenses inviting students to develop tools meant to facilitate forming communities of stakeholders: Students are invited to examine theirs and stakeholders’ mindset, perspectives, frameworks. The Design Thinking inspires our pedagogical tools. We particularly focus on activities that can bring about reflexivity, co-framing, co-design, futuring and ethical reflection with the ultimate goal of creating integrative knowledge in the form of artifacts, tools, methods and guidelines (van der Bijl-Brouwer, 2022). For example, based on the design future practice (Kelliher and Byrne, 2015), we co-develop with students futures methods to promote emancipation and provide tools to reflect on what scenarios, technology, and interactions are desirable in our societies, considering how technology can negatively impact (amongst others) our social fabric. Futuring methods facilitate students to engage in world-making that tangibly defines alternative worlds to immerse vividly in a socio-technical scenario. The world-making activity is often not done in isolation but in collaboration with stakeholders.

Nonetheless, we do not limit our attention to humans as stakeholders, considering more-than-human design scenarios in which the interactions and the needs emerge not only from the human as a centre of the world but consider nature in its different forms as well as digital agents, among others. In this context of learning, we propose our reflection on the use of generative AI tools in design education.

**Background and Related Work about Generative AI and Education**

**AI and generative AI: what they are and their societal implications**

The term artificial intelligence has become a common part of the public vocabulary. However, the usage of the term is often characterized by vagueness in terms of what kind of specific technologies it refers to and perceptions about what these technologies are capable of (see for example AI Myths³). Some of the prominent technologies that fall under the broad umbrella of AI over the past decade include image and speech recognition algorithms, voice assistants and, more recently, generative AI algorithms like ChatGPT and DALL-E⁴. These technologies are all examples of machine learning, which is a subfield within the broader field of AI. Machine learning itself encompasses a variety of approaches, but a basic common characteristic is that machine learning involves training algorithms to make classifications (e.g. what objects are present in an image?) or predictions (e.g., what is the next likely word in sequence of words?) based on patterns the algorithm detects in the training data (Zhou, 2021). While machine learning-based AI has demonstrated impressive performance for specific tasks and application contexts, it is also susceptible to basing its classifications and predictions on input-output correlations with no causal basis to errors and harm (Lovejoy, 2020). Whether an algorithm relies on correlational or causal data patterns will affect the claims that can be made about what kind of “understanding”, if any at all, AI algorithm exhibits (Bommasani et al., 2022). Bender and Koller (2020) have argued that large language models (LLMs) like ChatGPT, which work by discovering co-occurrence patterns in a sequence of text symbols, are theoretically not capable of understanding meaning of language. This points to the need to reflect on what is entailed by “intelligence” and “understanding” and be mindful of how we describe the capabilities of AI technologies to avoid misleading claims and unfounded hype.

The increasing use of AI technology has also raised profound socio-ethical issues, amplifying inequality, reinforcing stereotypes, and pushing people into categories that do not represent them. Due to design faults, systems might misgender people or not recognize gender identities beyond the binary types of male and female (Keyes, 2018). Facial recognition algorithms can be prone to not recognizing faces of people of colour (Buolamwini and Gebru, 2018) or labelling them as a potential danger to society (Grother et al., 2019). The roles, interaction models, and features we imbue embodied AI with can reinforce stereotypes, augment biases, and become renewed forms of coloniality. Smart assistants are, for example, often modelled on female submissive personas and reinforce homogeneity in language

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³ [https://www.aimyths.org/](https://www.aimyths.org/)
⁴ [https://openai.com/dall-e-2](https://openai.com/dall-e-2)
and culture (Lee et al., 2021). The social, health, and educative interventions involving embodied AI often reinforce discriminatory and outdated models, nudging to “normative” human behaviours and policing what it means to be human. For example, embodied AI systems for care focus on the interaction paradigm deemed to be ableist. Robots, IOTs, and other systems are often imbued with techno ableist principles, making them more subject to scrutiny (Zaga et al., 2022).

Similar issues happen in education when AI is used as an aid for educational procedures (e.g., proctoring) (Coghlan et al. 2021) and for creative purposes (e.g., using stable diffusion algorithms for image production or using LLMs for text production). Proctoring software uses facial recognition algorithms that have been shown to discriminate based on skin colour, restricting privacy and cause distress to students with often remarkable consequences. Software used to prevent exam fraud, Proctorio,\(^6\) has been found by the Dutch Human Rights Institute to be inflicting racist discrimination on students.\(^5\) Faces with dark complexion are not recognized by the software, students were occasionally ejected from the exam with error messages like ‘face not found’ and ‘room too dark’.

In general, the experience of being under constant, direct surveillance has been cited by some as a distressing and disruptive aspect of some forms of remote proctoring. The surveillance has been felt as dehumanizing and too far reaching for many students: students have experienced anxiety at the fact that physical movements including head and eye movements or changes in typing speed might be interpreted as cheating. Some remote proctoring services do not allow bathroom breaks or allow them only after a certain amount of time has passed.

The use of LLM and stable diffusion algorithms (generative AI algorithms that create images based on textual prompts) have also caused issues of bias and stereotyping, particularly with the tendency of teachers/students to respond to this technology with high expectation and sensationalism. LLM are perceived as cognitive agents able to understand language not only at syntax level but also at semantic level. Bender et al. (2021: 611) explain:

“(...) the tendency of human interlocutors to impute meaning where there is none can mislead both NLP researchers and the general public into taking synthetic text as meaningful. Combined with the ability of [language models] to pick up on both subtle biases and overtly abusive language patterns in training data, this leads to risks of harms, including encountering derogatory language and experiencing discrimination at the hands of others who reproduce racist, sexist, ableist, extremist or other harmful ideologies reinforced through interactions with synthetic language.”

Bender et al. (2021) coined the term stochastic parrot to describe how language models stitch together sentences from big data sets are more akin to parrots than human-like agents. The generated pieces of text have many sources unknown to the students/teachers using it, and it may reproduce citational injustice by obliterating marginalized communities’ data or perpetuating biases and stereotypes.

**Generative AI and human-centred/transdisciplinary education**

Generative AI tools based on LLM and text-to-image lay the groundwork for new avenues in human-centred and transdisciplinary design practices (Jo, 2023). LLM-based tools like ChatGPT could be used in various phases of the design process to generate user and future scenarios or to prototype personas or storyboards rapidly. These tools do not require programming knowledge and have intuitive graphic interfaces. Therefore, students and stakeholders can readily use them, opening spaces of transdisciplinary co-speculation and futuring (Matos-Castaño et al. 2023).

Text-to-image software as tools to support ideation, producing thousands of images from abstract idea, visualizing concepts and scenarios (O’Connor, 2023). Such software could also be used as a collaborative tool in participatory processes to support co-creation, co-speculation and world-building with stakeholders from disciplines different from design or from civic society.

However, as socio-technical systems, generative AI tools tend to perpetuate established societal structures and biases, bringing socio-ethical concerns to their use in education. Generative AI tools might lack a pluralistic perspective and pose a potential risk to the participatory, ethically oriented ethos of human-centred design and to the pluralistic and holistic ethos of transdisciplinarity.

Students (and teachers) may use LLMs to generate scenarios, personas or to shape the design of interactions. While LLM could be good tools to kickstart or sustain the creative process, they may contribute to dehumanizing people or

\(^5\) https://proctorio.com/
discriminating against them. Particularly concerning for students learning about human-centred design and transdisciplinary process, is a tendency to “involve” AI-generated users rather than actual human users. For example, the company “Synthetic Users” (https://www.syntheticusers.com/) offers automated user experience research to perform user research without the user. Many are voicing the necessity to “don’t believe the LLM hype” and to think critically, together with students about the use of tools such as ChatGPT. Luccioni et al. (2023) analysed systems like DALL-E 2, Stable Diffusion v1.4 and v2 and found that all three have a bias towards whiteness and masculinity, over-representing those in their results. The widespread gender, race and class biases bring about questions about what the AI defines and re-defines as human in design education. This points to a need for students and teachers to be trained regarding what AI represents, systematically excludes and reminisces. Such training would entail learning human-centred design and transdisciplinary skills to carefully assess how we explicitly and implicitly embed values that come from our culture in computing technology that support the generation process. HCD and transdisciplinary education may support students’ and stakeholders’ critical thinking with theories (e.g., intersectional feminism (Bardzell and Bardzell, 2011) and critical design (Bardzel et al. 2012) methods to reflect about the values, biases, stereotypes embedded in technology and imagine alternatives.

Methods

We reflected on our teaching practice to observe and explore how students are appropriating these technologies at a moment when we as learning communities are still debating on the fairness and the boundaries of acceptability of the uses of generative AI tools in design education. The teaching activity of our research group became then the initial field of exploration, focusing our attention on how students used the tools within assignments in which generative AI contributions were invited, to continue in form of an open conversation between teachers and students. First, we describe four cases observed within the teaching activity of our research group, three related to two bachelor courses and one related to a master course. For each of these cases, we defined a theme representing the way in which the tools were used. After the cases, we report the setup and the results of a focus group session in which two of the authors had a direct conversation with a group of nine students on the actual use, the limits and the students’ desires and expectations towards the use of generative AI tools when approaching design education at a high education level. Eventually, we discuss some of the insights and conclude proposing a series of questions that we address from our different perspectives, resulting in a form of auto-ethnography.

Cases studies from the practice

This section describes the cases we observed in the past module at the University of Twente. The cases refer to different courses in the Industrial Design Engineering bachelor and master programme, with all cases including coordinating, lecturing, and tutoring activities by the authors of this paper. In the table below (Table 1), we list the cases, specifying the student-initiated use of AI and the educational context. When no restrictions or indications on the use of generative AI tools were provided for the assignments, the use of such tools did not affect the evaluation of the assignments.

<table>
<thead>
<tr>
<th>Case 1</th>
<th>Bachelor, year 1</th>
<th>Group work</th>
<th>Tools to support reporting with original material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>For a group assignment in the course Human Factors, students were asked to analyse the characteristics of People, Activities, Context and Artifacts (PACA) for which they are designing (adapted from Benyon, 2019), and use personas and scenarios as research techniques. They were explicitly invited to use generative AI tools to support their work on the assignments, specifying the requirement to acknowledge the use and the scope of the AI tools within the assignment. Only 2 out of 15 groups made use of generative AI tools, without specifying the software. The first group used an AI tool to generate headshots for their personas, while the second group used an AI tool to generate ideas as part of the group’s ideation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case 2</th>
<th>Bachelor, year 2</th>
<th>Group work</th>
<th>Tools to compensate the lack of time and/or expertise - writing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>In the context of a course where students co-design with a person with a disability, one group assignment covered writing a paper that covers specific topics. The assignment is a form of collaborative writing and requires students to align their contributions in the final paper, for example in regular sections like an abstract, introduction, and discussion and conclusion.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. List of cases of use of generative AI tools observed by the authors in the past academic year
Noticing inconsistency in the writing, one of the authors reviewed one draft submission using an AI identifier tool, which strongly suggested that the group used generative AI in writing the abstract. Confronting the group with this during a tutor meeting, they confirmed that ChatGPT was used to support – as a sparring partner – writing abstract. The moment was used by the author to discuss the (potential) use of generative AI in doing assignments and performing work in general with the group. For the final submission, the group kept the abstract as written, adding an acknowledgement of the use of ChatGPT and a clarification on how it was used.

<table>
<thead>
<tr>
<th>Case 3</th>
<th>Bachelor, year 2</th>
<th>Group work</th>
<th>Tools to compensate the lack of time and/or expertise – visualization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>This case example refers to the same course as Case 2. As a final product, the students were asked to produce a model, and in this case the group presented a board game (Fig. 1). To define the aesthetics of the game, students took inspiration from the work of Syd Mead, an artist famous for his illustrations of future scenarios. The students fed the generative AI tool with an input addressing the figure and the style of representation, and adjusted the outcome until they found the image satisfactory enough to be integrated in their design. When students were asked to explain their choice of using Midjourney for the illustration, they responded addressing specifically the desire of a defined aesthetics, and the wish for a series of good quality illustrations needed in a short time.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Figure 1. The board game developed by the students in the context of the project, illustrated using Midjourney based on Syd Mead’s aesthetics. Credits: Midjourney, Miles Herbst, Leander Misera, Matthijs Velgersdijk and Mauricio Palomino Baez D’Oliveira Soares](image)

**Case 4**

<table>
<thead>
<tr>
<th>Master, year 1</th>
<th>Group work</th>
<th>Tools to synthesize a collective thinking effort (rapid prototyping of visual configurations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>This example refers to a group assignment in a first-year master course. Students were asked to focus on a specific design method to explore the challenge proposed within the course. One group decided to use co-design activities to address mental well-being among university students, and to do so they organized various focus groups involving participants representing their target group. Within one of the sessions, they used an image generator software (DALL-E) to visualize the results of the brainstorming about “stress”. The AI-produced images were subsequently used as a conversation starter in the follow-up session. In their final presentation, the students identified several benefits of using the AI tool, for example customizing the visuals and facilitating the interaction (Fig. 2).</td>
<td></td>
</tr>
</tbody>
</table>
Focus group with students

Set-up and methodology

We decided to organize a focus group with IDE students to the student perspective on using AI tools and how it may shape the future of design education. We aimed to have up to 10 IDE bachelor/master students, voluntarily participating in the focus group. Registration took place via an online form. In the form, we asked students to indicate the gender they identify with, their cultural background and their stage of studies to guarantee the representation of the diversity of the students, in case the applications outnumbered the space availability. During the focus group, the students were asked permission to use data that could be relevant to report the diverse representation in the group (e.g., gender, cultural background and level of education). The personal data were separated from the individual contribution to the discussion, and all the contributions are anonymized. An Ethical Review was submitted and approved before starting the activities. Students received a brochure explaining the research and an e-mail with the details about the location and timing, and they signed an informed consent form on the day of the focus group. Within the confirmation/invitation e-mail, the participants of the focus group were asked to prepare and bring with them “an example of something you have done using AI tools in the context of university or your professional design life – if you haven’t yet, think of a way you want to use these tools”. No compensation was offered to the participants of the study, but we provided food (pizza) to make it an enjoyable moment of discussion and to cater to the fact that the workshop took place after academic hours around dinner time.

The activity, facilitated by two of the authors, took place at the University of Twente DesignLab on May 22nd, 2023 between 18:00 and 20:30. The space used for the meeting was organized to an informal setting as presented in Figure 2: a set of chairs positioned in circle around a big table and surrounded by a screen and two whiteboards.
The focus group was organized in four moments, as represented in Table 2.

**Table 2 – structure of the focus group**

<table>
<thead>
<tr>
<th>Title</th>
<th>Scope</th>
<th>Participation</th>
<th>Activities</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Introduction of the study – general documentation (Open space to explore the use without judgement)</td>
<td>A &amp; A as facilitators</td>
<td>Facilitators introduce the scope of the workshop. Informed consent forms are distributed, signed and collected. Recording starts. Everyone eats pizza.</td>
<td>Jabra table microphone Intro brochure Laptop with MS Teams for transcription Informed consent form</td>
</tr>
<tr>
<td>Icebreaker</td>
<td>Personal introduction presenting their use of an AI generative tool</td>
<td>Everyone, in the big group</td>
<td>Everyone in the room introduces themselves with an example on how they have been using a generative AI tool so far</td>
<td>Pre-prepared material/homework assignment</td>
</tr>
<tr>
<td>Part 1</td>
<td>What are generative AI tools? What are their capabilities and limitations?</td>
<td>Individual reflection</td>
<td>Students list the AI tools they have been using or they know about, and they purpose for which they used it</td>
<td>Post-its on the whiteboards Open discussion Markers for whiteboard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group discussion</td>
<td>Grouping of the different tools in categories Identify their main qualities and their relation with HCD design education Ask students: How do these AI tools work? What kind of intelligence do these artificial intelligence tools have? Upside and downside of AI (practical &amp; ethical)</td>
<td></td>
</tr>
<tr>
<td>Part 2</td>
<td>Which AI technology would you like to see implemented? What if an AI is going to evaluate your project?</td>
<td>Individual reflection</td>
<td>Students are asked to give their coins to specific solutions presented before Turning the tables question</td>
<td>Evaluation of the different post-its with coloured stickers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group discussion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conclusion</td>
<td>Show where you stand!</td>
<td>Group activity</td>
<td>Facilitators create some statements and ask students to place</td>
<td>Groundline</td>
</tr>
</tbody>
</table>
The scope of the session was to investigate: a) previous experiences with generative AI tools, b) the perspective on their use in design education (risks and benefits) and c) the ethical concerns about the status of development of AI tools.

**Executing the focus group: findings and lessons learned**

Ten students applied, and nine participated in the session. Two identified as female, six as male and one as non-binary. Five students declared a Dutch cultural background, three identified with other European countries and one identified as a citizen of the world due to different ethnicities and multiple moves. Five students were 1st year bachelor, two students were 1st year master and the remaining two were in the other years of the bachelor.

**Icebreaker**

After the introduction of the activity (Fig. 3), students were asked to introduce themselves by saying their name and sharing their experience with generative AI tools in the context of design, within their studies or elsewhere. This activity was planned as a short introduction round, but students were talkative and elaborate in their answers, and questions started popping up from both the researchers and the students themselves. Since the conversation was interactive and full of content, the researchers let the activity unfold, giving each student sufficient time to introduce themselves. During the activity, one of the researchers acted as a facilitator, while the other took notes for use in the
central part of the focus group. Some students also started noting their thoughts on post-its distributed on the tables (Fig. 4).

The AI tools mentioned in this session were:

- **Midjourney** for sketches for ideation processes, for visuals to be included in final designs;
- **ChatGPT** for copywriting and report/abstract writing support, (experimentally) grading tests or looking for test answers during the study time, both explaining and writing code, finding information and interesting or useful resources, analyse data from different perspectives to have a holistic view, searching for new books, product life cycle (PLC) and storytelling;
- **DALL-E** for inspiration;
- **Akinator** for playing on guessing people;
- **Snapchat bot** to verify the limits when reaching sensitive topics or possibly dangerous interaction;
- **Nova** as example of use and marketing.

The main insights we collected from the icebreaker are the following:

- **Self-directed learning**: none of the students received a training or specific instructions on which generative AI tools to use, or what for, but they all heard or read about the tools and decided to try them by themselves. No lecturers had so far pointed them to generative AI tools as something they could use for specific purposes;
- **Ethics awareness**: students recognize the limits of generative AI tools, they identify biases and threats connected to the interface that in the case of textual applications could mimic interaction with real persons ["the problem is that the interface is a dialogue, because people started asking questions which were having a direct impact on their lives. (...) it might just give you data, but because it's in form of a conversation it makes it more easy to accept."];
- **Responsible use**: limitations are needed (which data are collected and stored, use of deepfakes), regulations on the possibilities of use in education are expected and they are willing to discuss them ["I think especially in [European Union] they're now trying to create some regulations and boundaries. I think that's a good thing"];
- **Limited trust of the results**: students using generative AI tools do not completely rely on the results for their deliverables, but tend to double check their correctness or to edit them further ["Like, when I ask it to make the abstract, like, I still change a lot"];
- **Quick production of final content**: students reported the discussion with other teachers related to the use of generative AI tools to shorten the iterations of getting to a polished result, specifically related to sketching habits ["I've talked with a Design Sketching [teaching assistant] about this issue...They said that one big change in our generation observed by [the teaching assistants] [...] is that when we ideate, we tend to want to create directly products. Not even rough ideation. Everything we draw has to have functionality, it has to have design."];
- **Need of sensemaking**: students explained that the university should take a leading role in supporting students' understanding of limitations and strengths of the structure and mechanics of different tools to empower the students in choosing to use them for the outcomes of the results of the interactions and not only for fastening specific steps in the design process ["I think the university, because your initial question what the university should do, it's what I earlier said as well that I think it should also explain how it actually works or what you're dealing with. Yeah. So from understanding what it does, you can understand its limitations and its strengths, so to say. And this might be able to use it more efficiently, but also help you and understand what is a real or useful answer and what is nothing.”]

**Part 1**

The main activity implied a collective reasoning based on the topics presented and discussed during the introduction round. The facilitators placed the post-its with the notes collected within the introduction session on the whiteboards, and students were asked to add further points if needed. Students were then asked to group them based on how they felt the topics on the notes were fitting the context of design education at the university level. Students defined five macro categories in which they distributed the post-its: research, business, consumers, artist, and study. Students did not elaborate specifically on their choice of grouping the post-its under these specific categories, but during the activity the group split in two parallel conversations focusing on examples of use and implications. One insight is that the use of AI for generating the answers to a test as preparational material have a limited usefulness if they are used in a mnemonic way instead of trying to understand the reasoning behind the response, since the order of the answers in a quiz can be presented differently during the exam session.

**Figure 5. Students discussing the themes**

**Part 2**

For the second part of the activity, each student received five black stickers that represented a hypothetical university budget that each student could use to finance the adoption or the development of a specific tool. They could spread the stickers among different options or decide to support a unique one.
Figure 6. Students expressing their preference for the implementation of specific technologies in the context of design education

Figure 7. Themes distribution and students’ preferences (black dots)

After distributing the stickers, the group took a moment to discuss the results. Due to time constraints, we did not ask feedback about each solution selected, but we asked the students to mention what they found striking in the results, or why they made specific choices.

The outcomes were really applied to the students’ interactions with educational material. For example, they would use AI tools to navigate the university website or the courses’ webpages to find information faster ["I think there’s a lot of useful information on there [...], but it’s really hard to navigate the website. [...] If you know what you’re looking for [...] and you can use an AI to actually help you navigate the pages, I think that would really be beneficial."]

The use of AI for grading tests divided the students. While some students would appreciate and support the possibility of using an AI tool to grade tests faster, others value the personal contribution of a human assessor and the possibility to ask a human for clarification on the grade ["If an AI grades my open answers, and then I ask why I got that certain grade for that certain answer, I don’t want the AI to answer to me, I want my teacher to answer to it. Or I will not need a teacher at that point."]

In conclusion, the students agreed on using the generative AI tools for speeding up the evaluation process, but they could not agree on its use when it comes to minor results related to the grading, impacting on the passing or failing of an exam. Exams are seen as one performing moment in time that the AI can evaluate, while the lecturer can follow the student’s process of learning and can support the grade with the contextual information related to the student. The lecturer can choose to adapt the grade when the effort of the student demonstrates consistency, while the evaluation from an AI gives less space for discussion ["A teacher can be like, ok I know this person always showed up to lectures, and asked a lot of questions, and this one little bit can, like, finish the course. I think that human touch might actually be a benefit, because they know some context that the AI cannot really grasp."]
Conclusion

To conclude the session, we proposed a reflexive activity engaging the physical presence of the students: we asked them to place themselves on the right or left side of the screen based on their (dis)agreement with a number of statements (Fig. 9). Based on their positioning, we asked them to explain the reasoning behind their choices.

The sentences proposed on the screens were produced by prompting ChatGPT with “write 5 short statements supporting the use of generative AI tools in design education” and “now write 5 statements against”, resulting in the sentences listed in Table 2. Initially, the students were not informed that the sentences were generated by ChatGPT.

Table 3 – List of AI generated questions used for the final activity

<table>
<thead>
<tr>
<th>Pro</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhancing creativity</td>
<td>Diminished human creativity</td>
</tr>
<tr>
<td>Generative AI tools in design education provide students with a powerful means to explore and generate unique and innovative design solutions. These tools can inspire</td>
<td>Relying too heavily on generative AI tools in design education runs the risk of stifling human creativity. These tools may restrict students’ ability to think independently and develop their unique...</td>
</tr>
<tr>
<td>2</td>
<td>Time and resource efficiency</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------</td>
</tr>
<tr>
<td></td>
<td>By leveraging generative AI tools, students can save valuable time and resources in the design process. These tools automate repetitive tasks, such as generating variations or prototyping, allowing students to focus on refining and iterating their designs more efficiently.</td>
</tr>
<tr>
<td>3</td>
<td>Expanded design possibilities</td>
</tr>
<tr>
<td></td>
<td>Generative AI tools enable design students to explore a wider range of design possibilities and experiment with different styles, shapes, and configurations. This expands their creative horizons and encourages them to explore new avenues of design thinking that might not have been readily accessible otherwise.</td>
</tr>
<tr>
<td>4</td>
<td>Learning complex design principles</td>
</tr>
<tr>
<td></td>
<td>Generative AI tools can help students understand and apply complex design principles more effectively. These tools provide real-time feedback, allowing students to experiment with different design parameters and instantly visualize the impact on the final output, aiding in the comprehension and application of design theories and concepts.</td>
</tr>
<tr>
<td>5</td>
<td>Industry relevance and employability</td>
</tr>
<tr>
<td></td>
<td>The integration of generative AI tools in design education prepares students for the modern design industry, where AI-driven tools are increasingly utilized. By gaining hands-on experience with these tools, students develop relevant skills and increase their employability, as companies seek designers who can effectively leverage AI technologies in their workflows.</td>
</tr>
</tbody>
</table>

Due to time constraints, we went through few options, specifically Pro 1, 2, 3, and Against 2, 5, 1, 3. Most of the students were close to each other in their positioning, and students that had strong opinions compared to the rest of the group were invited to share their thoughts.

At the end of the activity, students were informed that we used ChatGPT for framing the questions, which left them surprised because they could not recognize the external input. The final activity helped students reflect on proactivity and self-efficacy when using generative AI. Tools are helpful to support workloads if used as active learners rather than passive. Using the tools as passive learners will not support reaching learning goals but finding shortcuts.

**Discussion and insights from the focus group**

The students participating in the focus group were active and interested in the topic, resulting in very engaging discussions. The same group of students acknowledged at the end that despite a variety of perspectives that were shared, the same activity with another group of students would have provided different results. As facilitators, we found the session very pleasant in terms of the participative attitude of the students, only intervening a handful of times to stimulate or focus the discussion.

While we expected to touch on topics such as ethics, creative process and grading, we gained perspective and insights we did not expect. The main insights could be summarized as following:

- **Time and availability**: during tutorials, lecturers and teaching assistants are available for questions, but generally students experienced that they had to wait quite some time to talk to teaching staff. ChatGPT was presented in this discussion as an “immediately available” teaching assistant questioning the role of a human teaching assistant.
- **Cultural perspectives**: Students touched multiple times on moral perspectives and cultural aspects of using AI tools, how the use (or not) of generative AI tools was influenced by their previous education.
- **Different approach to ideation phase**: a common theme was the use of generative AI tools for brainstorming and ideating. Students covered many diverging examples of how they used it, from a sparring partner to gain inspiration (even using ChatGPT to generate inspiration for Midjourney prompts) to supporting ideation with visuals, and from asking for metaphors use in their design to creating methods to support the brainstorm process itself.
- **Grading processes, not results**: an extensive discussion occurred once the facilitators turned the tables on the students, declaring that they might want to use AI tools to grade their exams. Multiple students indicated that they were not comfortable with this, although students were also not against it if it concerned questions with a specific, factual answer. For open questions, there was more reluctance. Students emphasized that they would always want to have the human touch to grading leaving space for clarification and ensuring that the context of learning and the overall learning path of students is considered in the grading.
Reflection

In this section, we introduce some questions we faced while exploring the presence and the scenarios of integration of generative AI tools in design education from a human centred/transdisciplinary design perspective. While we offer our perspectives in form of auto-ethnography, we want to open them to the design community, inviting to the creation of a space to share experiences and positions to steer the integration of these tools in the future education and practice, within academia and beyond. How should we as educators respond to this development?

The focus group discussion sheds light on several possible uses of generative AI tools within HCD/transdisciplinary design. As one of the students remarked: “We are all curious people and like investigating and trying things ourselves, so if you are trying to keep us away from it, then people generally move even more towards it.” So instead of playing “cat and mouse” with every new use of generative AI in the classroom, it may be worth pursuing a balancing act that allows for beneficial educational uses while laying out ground rules for responsible use of generative AI by students and nurturing student reflection about capabilities, limitations and ethical impacts of these tools.

Beneficial educational uses may differ across courses and study programs. To identify beneficial uses, we need to ask how the use of generative AI can be helpful in achieving the educational goals of a given course or study program. Likewise, to identify harmful uses, we need to investigate how its use can be detrimental in the achievement of these educational goals. This can outline the space within which further deliberation can take place. It is essential that this dialog is based on clear-eyed understanding of capabilities, limitations and ethical impacts of generative AI tools. Having both representatives of students and educators participate in such a deliberation can help ensure consideration of diverse perspectives and needs. Furthermore, having educators and students co-design strategy and policy may increase the chance these would be embraced by both going forward. The strategic component here needs to address what kind of resources (knowledge, activities) students and educators need to develop reflection skills for professionally and ethically responsible use of generative AI tools in HC/TS design education.

Discussion topic 1: What is students’ level of understanding of how generative AI works, its knowledge production paradigm, its capabilities and limitations? What are some common misconceptions students have and can be addressed by design education?

In our roles as teachers, we have observed the students appropriating various generative AI tools and introducing them in courses for which we were not always directly foreseeing their use. The focus group was definitely an occasion to sit at the table with the students and listen to their perspectives, trying to limit our intervention in the discussion and to avoid steering the conversation to follow our expectations. What surprised us the most was the motivation and the awareness that the group of students demonstrated. We reached a very motivated group of students, proactive and curious but also critical and outspoken – a pearl we should treasure and make grow together with us in an open educational environment. Topics as the mechanics beyond these “new” generative AI tools are interesting for them to be understood before choosing to use them. Also, their use is done in a very critical and responsible way, questioning the outcomes but relying on them when the institutional response does not reach them in a short time. AI fills the spaces that teaching assistants and professors might be too busy to cover, or support their explanations in a more simple and accessible way. Moreover, the students are well aware of some ethical concerns, such as the resemblance of the interfaces to human contact and therefore its misleading aesthetics. Students also expressed wishes for some limitations on use to be developed. By playing around with the tools in an explorative way, the students reflect on the structure of these tools and they recognize and use them as such: tools that support their work. This goes already beyond the sensationalistic perspective we can continuously find on LinkedIn and Twitter posts. Nonetheless, as acknowledged earlier, we cannot assume that the findings from this focus group would be valid for the student population at large.

Moreover, the use of generative AI tools as exploration and data collection tool raises different concerns when this is directed to substitute the involvement of real participants, or is used to trick them to believe that they are interacting with other people and not digital agents. The boundaries of when a technology is doing good and what is instead used as a pacifier are blurred. In recent years, different approaches claimed the need for
“warm technology”, specifically when addressing the desires and the needs of vulnerable people (Ijsselstijn et al., 2020). The possibilities offered by text generators such as ChatGPT in terms of shortcuts when it comes to involving stakeholders are unlimited, thinking of optimization of survey results or the creation of personas, for example, but also the threats on which these systems are generated. High education in design should provide a safe space for students to explore the different perspectives and different ways to involve participants, collect and produce data to inform their designs, but mostly it needs to form students that have enough critical thinking to discern when the use of a tool is appropriate, when the data produced are inclusive and respectful, and when they should design for informing the tools themselves.

Discussion topic 2: What’s the distinction between plagiarism and cheating if teachers cannot distinguish the quality of the contribution themselves? Can students use AI only if they declare so, or do we need to reframe the assessment of the assignments instead of limiting the use of new tools?

In the early 2010s, on-line petitions addressing fashion magazines for teenagers emerged, requiring these magazines to use “Photoshop free” images and/or to declare when pictures portraying a model was real or edited. The abuse of photoshop on the female images sold through these magazines was addressed as a cause of eating disorders between teenagers and young adults struggling to keep up with unrealistic fashion standards. Declaring the use of a tool should activate our awareness that the content is not what we expect it to be, but we still need to know the capacities of the image editing tool to be able to discriminate which parts are edited and which parts are real.

Similarly, there is a need to clearly appreciate which parts of a student assignment are the product of human work and which are AI-generated. Adopting such transparency can facilitate the larger conversation on (in)appropriate uses, implying the comprehension of the assignments and the relation with the tools, and call for active reflection by students in dialog with teachers. The use of generative AI tools should not be demonized but instead openly recognized, subject to critical reflection. It might also require an effort on our side to adapt the assessment of learning rather than entering a witch hunting process.

Furthermore, it is meaningful to include how different associations are already taking a stand in the conversation on the use of tools such as ChatGPT in the academic context: the American Psychological Association, whose APA referencing style is widely adopted nowadays in scientific writing, provides information on its website on how to quote ChatGPT.

In the examples extracted from the courses, we saw students using the tools to save time, applying them for parts of the assignments that required knowledge that was not part of the course. The initial input (prompts) was always coming from the students. Intellectual property rights were respected and acknowledged in terms of inspiration, and good quality images were provided instead of approximate sketches that would have diminished the effect of prototypes. For example, students used a tool to quickly generate an immediate artistic visualization of the topics discussed with participants of their study, with a quality that would have taken more time for an expert digital artist. In another example, texts were written with the support of ChatGPT to correct the grammar and to make the writing fluid and coherent, supporting them in a writing exercise itself challenging when done in a language that is not always their mother tongue. Furthermore, the specific academic style is sometimes hard for experienced academics, not considering people that might have learning impairments or cognitive disabilities. Again, students are mature enough to know if they are taking a shortcut from their learning process by skipping an exercise and therefore placing themselves in a position of ignorance in a later stage, or if their choice to use a specific tool strengthens their work. As educators in the design field, we should aim for original results but mostly for responsible designers.

Discussion topic 3: How can students develop critical thinking and recognize the biases in generative AI and nourish these emerging systems towards social justice? What is our role as lecturers in this?

7https://apastyle.apa.org/blog/how-to-cite-chatgpt
Education on generative AI tools is then the first step to take for both teachers and students. We need to approach this with an open and critical mind, so we can recognize how these tools can both aid and undermine the goals of design education, and eventually integrate with other tools we are already using. There might be cases in which we purposely decide to use generative AI to provide input for the learning activity, or we can explicitly decide that these tools do not fit the learning objectives of a specific course and keep them out. If the use of generative AI tools provides a component that is not part of the expected learning (e.g. part of the assignment that will not be evaluated), it is a fair step to use the tool to address the component so the students can use the gained time to focus their attention to the main objective of the learning. In any case, the reasons should be clear and transparent, to avoid miscommunications and to support the learning as such.

When thinking about our role as educators, we should always be aware on how we deal with young adults that are forming their opinions while addressing complex societal issues. We need to support them by reasoning together on the pros and cons of specific tools, a formative moment for both parties. The transparency of communication and the uncertainty that could emerge from our side will be appreciated by the students when genuine, and a collective sensemaking process will bring to new dynamics of co-existence of tools, methodologies and new approaches.

Our students already have strong opinions and are faced everyday with new contents on which they are asked to take a position. Underestimating their voices will enhance the distance they might feel between the world of academia and the real world, when in the practices they can adopt specific tools and use data that for academia takes years to be integrated. Students develop critical thinking when we open the space to reflect together about capabilities and limitations of generative AI, the biases present in existing tools, and we discuss together on how these biases ended up there and why they will be harmful.

The students we involved in the focus group clearly stated how they prefer to have a “real person” grading them, and they pointed to the risk implied by interfaces that simulate the digital human presence. Their ethical concerns are combined with their wish for clear boundaries and limits, on the topics discussed with generative AI tools but also in terms on accessibility of data and awareness of the shortcuts to trick the AIs to deceive these limits.

Conclusion

Our conversation paper aims to raise questions more than providing answers. We open up a discussion between us and we want to expand our wishes and concerns for the adoption of generative AI tools in HC/TS design education, with the hope that our fellow colleagues and students of the design community - and other learning communities, are willing to share their thoughts and think along with us.

Here we propose some observations from our teaching experiences and we involved students in the reasoning through a focus group, aligning our actions with our studies and principles. Lastly, we discussed, wrote, discussed again, and re-wrote some ideas that partially address the questions beyond this process.

To conclude, this paper aims to be a start for further reflection on how to implement these new tools by sharing best practices and other case studies, but also on how as design community we can and should influence the direction of their design and the way they are communicated and perceived by society as wider network of stakeholders. Hence, we offer our open questions below:

- Thinking of technologies that promise to be disruptive when introduced to a general public: what are some key facets to know about how generative AI works to enable more informed and reflective use in the HCD classroom and in collaboration with stakeholders?
  - To what extent should generative AI tools be allowed to support in the writing of an HCD/TSD paper or documentation?
  - To what extent should generative AI tools be allowed to produce images that are used in the HCD/TSD process?
To what extent should generative AI tools be used to substitute real people when creating personas or crafting scenarios? When and how those results in lack of user/stakeholder involvement?

- How can teachers educate themselves on the use of generative AI in their practice while teaching about the ethics of their use?
- How can we/shall we direct the student’s use of generative AI to create a (more) inclusive AI?
- How can we collaborate with generative AI tools to provide plural perspectives?
- How can we incorporate critical theories and practice to HCD and TSD practices while “collaborating with generative AI”?

The conversation contributes to laying the groundwork to assess and explore the entanglements with design and generative AI and in particular to shape a discussion on how these tools can not only contribute to the learning objectives of HCD and TSD, but also going beyond the current hype for the capabilities of the technology and build a more inclusive, plural and just learning environment, foreseeing the integration of generative AI in a more-than-human education futures.

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**References**


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