

## Research Brief – Q1 2025



# Art Making with AI to Foster AI Ethics Literacy

By Anna Keune & Santiago Hurtado

**AI in education raises ethical concerns. However, the area of best practices in teaching AI ethics remains under-researched. This brief shares a research study depicting how art-making with generative AI and tangible crafts can support young people in learning about AI ethics. Using constructionist and post-digital perspectives in education, we analyzed how young people produced artistic projects and how the artistic process led to the production of AI ethics principles. In the brief, we share data excerpts to illustrate how co-creative processes with AI are conducive of AI ethics learning. Iterative collaboration across digital and tangible artifacts creates opportunities for recognizing intersecting AI ethics. This research informs design recommendations for AI ethics teaching and learning.**

## Introduction – A Constructionist Approach to Learning about Ethics

The increasing integration of artificial intelligence (AI) in education necessitates a focus on AI ethics literacy to safeguard children (Luckin et al., 2016; Luckin & Cukurova, 2019; Vartiainen et al., 2024). Developing AI ethics literacy is vital for equipping young people to navigate an AI-influenced society (Casal-Otero et al., 2023; Ng et al., 2021; Stolpe & Hallström, 2024). However, despite a long-standing connection between creating personally meaningful designs and learning about AI, how digital and tangible design may foster an understanding of AI ethics remains under-researched.

To investigate how digital and tangible design could support young people in developing AI ethics literacy, we build on constructionist learning theories, which posit that the manipulation of digital and tangible artifacts toward a designed project, publicly shared with others, supports people in internalizing complex domain knowledge (Papert, 1993). Constructionist learning theories developed alongside AI to model socio-cognitive processes (Papert & Solomon, 1971; Kafai & Morales-Navarro, 2024) and to facilitate learning about AI's societal relationships (Kahn, 1977; Kahn & Winters, 2021).

Constructionist research shows that engaging with AI can foster self-reflection and cognitive skills (Kahn & Winters, 2021; Ojeda-Ramirez et al., 2023). Designing activities that have the possibility for young people to generate their own AI projects is a constructionist approach that is of particular relevance for supporting young people in understanding the socio-technical implications of AI (Kahn & Winters, 2021; Morales-Navarro et al., 2023; Kafai & Morales-Navarro, 2024), while ensuring a focus on ethical awareness (Druga et al., 2022).

For instance, constructionist research shows that blending tangible and digital approaches to learning can improve learning outcomes (Zacharia & deJong, 2014; Olympious & Zacharia, 2011) and that tangible AI activities can foster conceptual understanding of AI for young people (Dai, 2024; Dai et al., 2023; Lindner et al., 2019). This is substantiated by research on

unplugged AI activities, such as PlushPal (Tseng et al., 2021), with which young people learn about machine learning through data sampling while animating plush toys.

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To approach digital and tangible approaches to AI ethics learning, we draw on post-digital perspectives, which challenge the digital-tangible binary and emphasize that digital interactions exist alongside tangible ones (Macgilchrist, 2021; Rowsell, 2024; Burnett and Merchant, 2020; Ehret et al., 2022). Post-digital approaches call for the consideration of materiality in technological design (Colvert et al., 2024) and encompassing ethical and socio-material implications of AI that are produced at the intersection of digital and tangible interactions (Jiang et al., 2024). Post-digital approaches are relevant for AI ethics learning because they guide us in analyzing the digital-tangible flow of interactions as well as transformation processes that happen when tangible art becomes digital through iterative digital and tangible design. Untangling this fluidity is crucial for understanding AI ethics production, for instance, AI's role in augmenting creativity.

To investigate how digital and tangible design can support AI ethics literacy learning among young people, we facilitated a workshop with arts-based activities for young people (13-15 year-olds) using AI tools and crafts. Findings show that iterative design processes across digital and tangible contexts provided rich opportunities for AI ethics learning, advancing understanding of collaborative learning with AI.

## Designing for AI Ethics Learning – Methods

This qualitative study explored AI ethics learning through blended digital AI-generative arts and tangible craft-based design in a four-day workshop

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Source Title Page Image: Learning Sciences and Design Lab,

Santiago Hurtago

with 12 girls. We designed seven arts-based activities guided by constructionist approaches, incorporating iterative tangible and digital design cycles. Activities included replicating artist work with AI, combining drawings with magazine cutouts and textures, and expanding frames with drawing and AI.

The activity designs were guided by OECD AI principles. The OECD AI principles offer a framework that is widely recognized in AI policy (OECD, 2023; G20, 2019; GPAI, 2022), which includes: (1) Inclusive growth, sustainable development and well-being; (2) Respect for the rule of law, human rights and democratic values, including fairness and privacy; (3) Transparency and explainability; (4) Robustness, security and safety; and (5) Accountability (OECD, 2023). During the activities with young people, we introduced OECD principles via cards and discussions.

**The youths cited AI as vague due to unexplainable outputs or the lack of information given by AI systems about its outcomes.**

We captured five data sources to understand how the digital-tangible activities supported AI ethics literacy among youth: (1) Semi-structured group interviews on AI ethics; (2) video-recorded group presentations; (3) video observations of design processes; (4) screen recordings of AI design and (5) project images. Interviews and presentations addressed AI ethics principles produced. Process videos, screen recordings, and project images captured tangible-digital processes.

To analyze AI ethics literacy, the data analysis included: (1) coding interview and presentation data for OECD AI principles using a codebook we developed through a pilot study (Keune et al., 2024) and (2) micro-analysis of design processes to identify tangible-digital transformations and processes producing AI ethics learning.

### **Findings from a Blended Digital/Tangible Learning Design**

Youths actively engaged with AI ethics principles during art creation with AI, demonstrating an increased depth of engagement over the workshop.

*(i)Producing AI ethics in tangible and digital design: The activities facilitated discussions of all OECD principles.*

**Inclusive growth, sustainable development and well-being** – Youths discussed aspects of this principle in relation to augmenting human capabilities and enhancing creativity, especially regarding AI's role in promoting or interfering with these ethical elements. They noted AI could inspire novel directions, but questioned if AI enhanced creativity when outputs strongly deviated from their expectations. AI was seen as augmenting capabilities when outputs were related to, but not identical to, expectations. This meant that if a prompt resulted in a completely different output or a very predictable output, youths did not consider that AI contributed to their creativity or augmented their capabilities.

**Respect for the rule of law, human rights and democratic values** – Youths consistently reflected on supporting human agency and autonomy, recognizing non-discrimination, equality, diversity and social justice, and respecting privacy and data protection. They critiqued AI for limiting their creative control as they observed biases in their outputs (e.g., gender bias in representing women) and raised privacy concerns about AI replicating their artistic style (e.g., questioning data sources and permissions to use, reuse and remix).

**Transparency and explainability** – This principle was consistently discussed throughout all activities. Overall, the youths cited AI as vague due to unexplainable outputs or the lack of information given by AI systems about its outcomes. Youths questioned AI's lack of transparency while exploring how it worked and generated outcomes through repeated and iterative written and visual prompting to improve their designs. The participants noted unexpected and unprompted visuals appearing in their designs during iterative creation processes with AI (e.g., a trash bin as part of a firework in a city). They attributed this to a lack of explainability: Youth's prompts and iterations did not match expected outputs, which hindered their understanding of AI's functioning.

**Robustness, security and safety** – Youths discussed elements related to *ensuring robustness, speculating foreseeable use and acknowledging misuse or adverse conditions*. The youth highlighted AI as being "overwhelmed" or "confused" with their tangible inputs (e.g., a picture of felt and paper clips),



which made the AI outputs inconsistent with the youth's expectations. Moreover, they considered AI's ability to replicate artistic styles potentially leading to authorship and copyright issues as they experienced the AI replicating their own style easily. Other elements of this AI principle (i.e., *ensuring security and safety*, and *providing traceability*) were not discussed during the activities, as they were less related to the arts-based activities we facilitated. Nevertheless, these are relevant aspects of this AI principle and could be focused on in activities that center around safety and security in AI ethics.

**Accountability** – The principle of accountability is related to all the other principles as it calls for the other four principles to be present within an AI ethics evaluation. Overall, youths mostly discussed *features to ensure ethics* when talking about possible ideas to ensure AI ethics accountability. One group pointed to AI developers' responsibility for ethical interface design, suggesting features like warnings and buttons to address potentially problematic outputs.

Overall, the activities supported reflections of all OECD AI principles. The youths' artwork creation across various activities produced encounters with unethical aspects of AI tools. Arts-based AI activities included aspects of creativity and ownership of artwork created by participants and AI, providing visual and tangible examples of the tensions of ethics in AI tools. Moreover, various types of AI inputs (i.e., prompts, black-and-white drawings, textures) challenged AI functionality and evidenced AI's limitations. Nevertheless, not all elements within the AI principles were present, such as the principle of accountability, and should be considered when intentionally designing and facilitating such principles and elements.

*(ii) Design-based and youth-centered processes leading to AI ethics literacy*

To understand how AI ethics literacy was produced, we conducted a micro-analysis on the tangible-digital transformation within the art-making process, that is, how tangible artifacts turn into digital ones and how traces of tangible and digital designs got integrated into youths' design projects. These transformations captured the interplay between human creative input and AI-generated outputs and made it possible to analyze how AI ethics discussions emerged from the design process. This is important because it helps to understand how to design for AI ethics through design

processes across familiar, tangible and less familiar, digital and AI-based design.

**Tensions related to agency emerged as the group noticed how prompting resulted in surprising AI-generated outputs, illustrating that the design process was at times out of their control.**

One example of this was a group that added magazine cut-outs to hand drawings. The group comprised four youths (Lisa, Freya, Anya and Molly; all pseudonyms) who created a black-and-white drawing of a skull with a floral arrangement and took a picture to create a digital copy that they also printed. They edited the digital copy with AI and then layered magazine cutouts onto the printed copy. Finally, they took a picture of the printed copy with magazine cutouts and edited it with AI. The group's repeated attempts at editing their designs with AI through multiple iterations of drawing, photographing, uploading digital pictures to the AI system, editing the design with the AI systems and printing the outcome led to unexpected results that fostered reflections about AI ethics. Here, we share how this process was supportive of AI ethics engagement with the example of human agency and transparency.

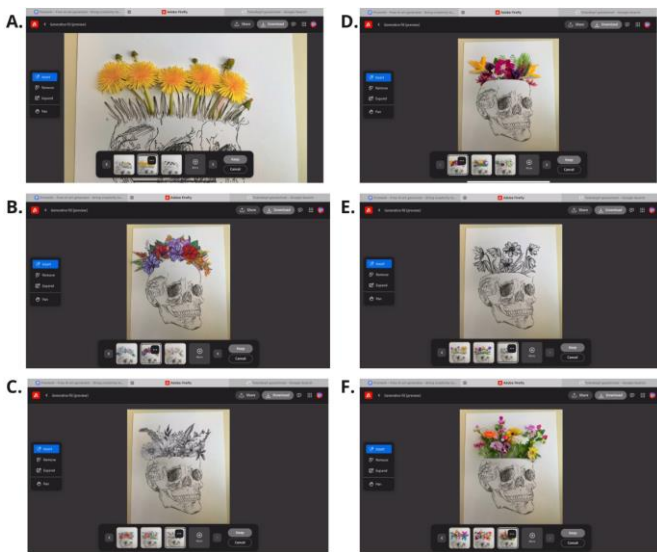
First, the art-making process with AI supported conversations on ethical concerns related to **agency** (connected to the OECD principle of respect for the rule of law, human rights and democratic values, including fairness and privacy). Tensions related to agency emerged as the group noticed how prompting resulted in *surprising* AI-generated outputs, illustrating that the design process was at times out of their control.

The group started by hand drawing a skull with a floral arrangement and digitizing it. The group proceeded to edit the floral arrangement on the skull with AI, involving several iterations of selecting an area, writing a prompt and generating an output in the selected area. The various iterations, visualized in Figure 1, generated:

(A) realistic dandelions when prompted to generate various types of flowers; (B) realistic colorful flowers when prompted to generate tropical flowers; (C) hand-

drawn flowers and an altered skull shape, when only prompted to generate drawn flowers; (D) black-and-white dandelions when prompted to edit the skull back to its cut shape and to include drawn flowers; (E) varied flowers in black and white when prompted to make flowers tropical; and (F) realistic-looking colorful flowers when prompted to include colorful flowers.

**Figure 1.** Examples of the AI iterations of the floral arrangement on top of the original artwork of a skull



The process of AI generating unexpected outputs, such as a realistic style or editing the shape of the skull when unprompted, led the youths to talk about AI ethics in terms of **agency**. For example, Anya said:

*“For the first task, we didn't actually tell the AI which flowers they needed to create, we just told them to create tropical flowers. And every time they just made another kind of flower, so **it was really the AI's decision.**”*

Anya's reflection highlights that the AI decided which type of flower to generate. As the group did not include a type of flower in their prompts, they noticed that AI took over the decision of which flowers to generate. This is related to agency, because the youths questioned AI's role in their design process. This produced tension, because the youths considered that AI supported their designs, while it was also important to them to make decisions about their design process and products. Lisa said:

*“So you can experiment and make new things that no one has done before, **but you have to try to decide all the things, not just give a direction.**”*

Lisa's comments pointed to AI's affordances in creating products the youths had not tried before (*“make new things that no one has done before”*). Lisa also emphasized that for people to remain in charge of the design process and outcomes, they would have to create detailed prompts that would reflect clear decisions about the envisioned outcomes (*“you have to try to decide all the things”*). Using AI for design resulted in new suggestions the youth would not have thought of. When the AI generated such unexpected outcomes that the youth liked, they kept the changes otherwise, they removed them and iterated once more. It was this tension-filled creation process, also expressed by Lisa, that showed a keen awareness of AI ethics related to agency and was made possible by the design process with AI. The tension about agency that came out of the process of making art made AI ethics tangible and possible to talk about.

Second, the art-making process with AI also supported conversations on AI ethics related to **transparency**. For example, transparency emerged when the youth edited the printed copy of their original artwork with magazine cutouts and then with AI. The group added a new style to their artwork with the magazine cutouts, which in turn made editing with AI more difficult because several styles were integrated in the tangible outcome. This prompted the group to explore how AI worked through various iterations of prompting, which led to reflections about transparency, because the group had to make assumptions about AI's functionality.

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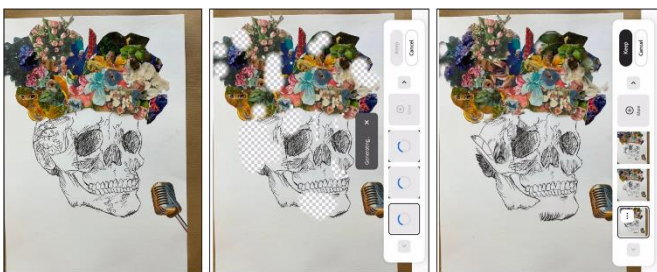
The group created a physical collage with magazine cutouts on a printed copy of their original drawing (see Figure 2). The process of layering cutouts on top of the drawing was transparent. The youths sourced elements from various magazines, selected which images to include and tested the placement of the cutouts before gluing them into place.

**Figure 2.** Original artwork of a skull with flowers (left) and a printed copy of the artwork with magazine cutouts (right).



After completing the tangible editing through cutouts, the group digitized this artwork to continue to edit with AI by adding green ivy vines to the skull, complementing the colorful floral cutouts. Yet, they encountered challenges because the AI did not generate the vines. For example, the group selected several areas of the drawing and added the prompt “Poison Ivy growing, Ivy strings hanging, tendrils.” Yet, the output deleted some of the selected areas from the drawing (e.g., the jaw line; Figure 3). To achieve their goal, they went through 17 iterations of area selecting and prompting, in which the AI often misinterpreted the youths’ prompts. At times, AI ignored instructions, and at other times it introduced unprompted modifications.

**Figure 3.** Original design (left), selected areas to be edited with a prompt (center), and the generated output (right).



The AI iterations and comparisons with the tangible editing with magazine cutouts produced opportunities for AI ethics reflections on **transparency**. For example, Freya said:

“[...] And here we wanted to add some ivy, like, here. But it took so long, and it always looked so bad. [...] I

think that it [AI] wanted to make the same theme, like a pencil drawing, but it did definitely not work.”

Freya reflected on the reason for AI not generating what they wanted, possibly due to the AI deciding which style (i.e., pencil drawn or magazine cutout) to generate. The multiple iterations of the group to generate the desired output made it possible for the youths to explore the workings of AI as they had to make assumptions about how it worked to get to the outcome they wanted. Finally, the group was able to interact with AI in such a way that it would generate what they wanted - the ivy vines. Lisa said:

“It is better to put in things one by one. Because it gets confused when it has to do many things at once.”

Lisa concluded that the AI could not create floral additions because of the several styles combined (“it is better to put in things one by one”). So, the youths resolved to add each leaf individually. The iterative experimentation toward producing the ivy leaves involved reflections on AI ethics in **transparency**. The art-making process made it possible for the youths to talk about transparency by probing into the black box of AI, showing that the AI was not transparent in its functionality.

Overall, the activities provided various cycles of iterations of tangible and digital back and forth while co-editing and co-creating artwork. The inclusion of various types of inputs in the activities produced AI ethics reflections related to the youths’ experiences in creating artwork. Grappling with AI’s black box fostered ethics inquiry, showcasing how AI and tangible iterations directly produced ethics learning. The experience of iterative tangible-digital making transformed abstract ethical principles and elements into experiences for AI ethics learning.

**The art-making process made it possible for the youths to talk about transparency by probing into the black box of AI, showing that the AI was not transparent in its functionality.**

## Discussion

This study investigated how tangible design combined with digital AI-based design produced opportunities for AI ethics. The results of the study demonstrated that combining tangible materials with digital AI promoted AI ethics conversations, strengthening AI literacy skills necessary for navigating an AI-driven world. While the activities engaged the youths with many OECD AI principles, there is a need for more targeted and in-depth facilitation. The seamless integration of physical and digital components facilitated meaningful discussions on human capabilities, creativity, agency, data privacy and transparency related to AI systems. The study highlights that intentionally designing for blended tangible and digital AI-related activities can be a productive approach to developing AI ethics literacy.

## Acknowledgments

This study is supported by the IEAI and is a product of interdisciplinary teamwork on the project [“Co-designing a Risk-Assessment Dashboard for AI Ethics Literacy in EdTech”](#). We acknowledge inputs and contributions by co-PI Prof. Dr. Urs Gasser, co-PI Prof. Dr. Matthias Grabmair and the members of the interdisciplinary research team, including: Camila Hidalgo, Noha Halim, Jonas Moukit Seidou and Santiago Forero. We thank the TUM Institute for Advanced Study (TUM-IAS) for their support.



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