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Uncovering Youth's Needs and Concerns About AI Through Art-Based Participatory Design

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ABSTRACT

As generative AI becomes embedded in adolescents' everyday lives, it is important to understand what young users want from these systems, what concerns they hold, and how these perspectives should shape youth-centered AI design. This study investigates early adolescents' perspectives on generative AI through a four-week art-based participatory workshop with 55 middle school students. Using comic storytelling, AI-themed clay modeling, and reflective discussions, participants expressed their understandings, concerns, and expectations through visual and narrative artifacts. Inductive qualitative analysis revealed recurring patterns in how youths imagined AI's roles, articulated tensions around autonomy, dependency, and responsibility, and identified values important for maintaining agentic relationships with AI. Our findings show that participants came to recognize the importance of autonomy, critical understanding, and relational boundaries in engaging with AI. Based on these insights, we propose design implications for youth-centered AI systems that support agency and developmentally appropriate, ethically grounded engagement.

KEYWORDS

Youth-centered AI design; participatory design; Human-AI interaction; art-based participatory design workshop

1. Introduction

Artificial Intelligence (AI) is becoming a pervasive presence in the young users' daily lives. Whether through conversational agents, large language models (LLM)-powered assistants, or generative image and content creation tools, early adolescents are increasingly encountering forms of generative AI that do not merely deliver information, but actively produce language, images, and narratives (Holmes & Porayska-Pomsta, 2022; Seo et al., 2021; TikTok, 2022). As members of a generation that will not only grow up with AI but live alongside it throughout their lives, early adolescents are positioned as both current users and future co-inhabitants of AI-shaped societies. Accordingly, there is a growing need to design AI systems that meaningfully reflect youth's needs, values, and lived experiences, rather than treating young adolescent users as peripheral or secondary stakeholders in AI systems primarily designed around adult users or experts' assumptions (Rubegni et al., 2022; Wang et al., 2023). Understanding how youth perceive and relate to AI is therefore not just critical, but essential for informing the future of youth-centered AI design (Andries & Robertson, 2023; Belghith et al., 2024; Dangol et al., 2025).

However, capturing early adolescents' unique perspectives on AI is not always straightforward, particularly in relation to generative AI systems that present themselves as expressive, conversational, and seemingly social entities. Several factors contribute to this challenge. First, traditional user research methods such as interviews or surveys are often insufficient when applied to youth, who may find it challenging to verbalize abstract ideas about algorithmic systems (Lee et al., 2019). Second, youth's experiences with AI are typically shaped within parent- or teacher-driven settings—contexts where their use of AI is highly regulated, task-oriented, or directive in nature (Rubegni et al., 2022; Wang et al., 2023). These regulated environments provide limited opportunities for youth to engage in self-directed reflection or to construct their own views of AI (Lee et al., 2023). These constraints suggest that early

adolescents' understandings of AI are often affective, relational, and still in formation, rather than articulated as stable beliefs or explicit expectations. Consequently, there is a clear need to develop approaches that allow youth to actively and freely explore how they relate to AI.

Building on this need, our study examines how early adolescents articulate their needs, expectations, and concerns around generative AI, particularly as these systems are imagined as emotional and functional companions in everyday life. Rather than approaching youth perspectives as abstract opinions about AI, we focus on how such understandings emerge through youths' own narratives and expressive practices. To access these perspectives, we adopted an art-based participatory approach that centered on expressive, story-driven activities—including comic making, AI-themed clay modeling, and peer discussion (see Figure 1). These activities incorporated *familiar material*, *open-ended*, and *unplugged* attributes of art activities, allowing early adolescents to articulate emerging thoughts and feelings about AI with greater freedom and relevance. Through this process, we surfaced how youths' relationships with generative AI were negotiated in narrative form. Our findings show that early adolescents' perspectives consistently took shape around how they imagined AI's role, articulated emotional or functional tensions, and envisioned possible resolutions, as well as the values they considered important for maintaining an agentic relationship with AI. These insights inform the design of human-centered AI systems that are attentive to youths' autonomy and relational needs.

The contributions of this study are threefold: (1) We reveal how early adolescents perceive and imagine their relationship with generative AI as an emotional and functional companion, illuminating the needs, expectations, and challenges they encounter in interacting with AI in everyday contexts. (2) We identify a set of values and priorities that middle school students articulate as important for maintaining a sense of agency in their relationship with AI. (3) We derive design recommendations for youth-centered AI systems that foreground autonomy, emotional safety, and relational awareness, demonstrating how art-based participatory visual storytelling can inform early-stage AI design for younger users.

2. Related works

2.1. Youth's growing relationship with AI

With advancements in AI technology, we have incorporated AI into many aspects of our daily lives. Finding service devices that do not utilize AI is becoming increasingly difficult. This impact extends not only to the general public but also to the younger generation. Youth today regularly encounter AI-powered devices and software in daily life since childhood. The integration of AI has offered equal access to information, entertaining them, and aiding in areas they find challenging, such as social skills, creativity, math, coding, etc (Kazemitabaar et al., 2023; Lee et al., 2023; Yang et al., 2023).

In these situations, youth perceive their relationship with AI in mixed and situational ways. Some studies have shown that youth often perceive these systems as having human-like characteristics and

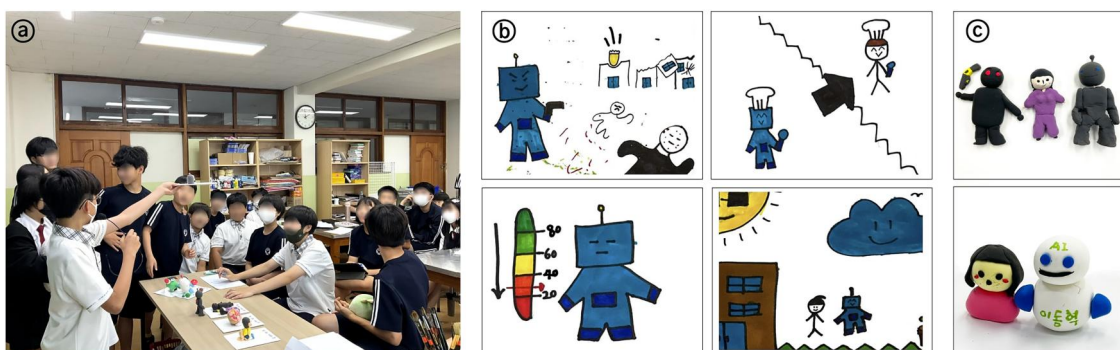


Figure 1. (a) Capturing the moment when participants share their design outcome in the participatory design workshop. (b) Comic artifact created by team 11 during workshop: This story is about an AI that surpasses human intelligence and begins to control them. To address this, humans reduce the AI's intelligence and retake the jobs previously managed by the AI. This leads to the reestablishment of a harmonious coexistence between humans and AI. (c) Artifacts made of playdough depicting the AI and the main character from the comic created by team 4 and 10.

develop social and emotional relationships with them. For example, some young users often anthropomorphize conversational agents and may treat them as sentient friends or companions, blurring expectations and reality in their interactions (Goldman & Poulin-Dubois, 2024). Many kids even believe it is wrong to be rude to voice assistants, indicating that they afford these AIs a form of social status or feelings. At the same time, youth demonstrate a nuanced understanding that distinguishes AI from humans (Andries & Robertson, 2023). Rubegni and Yip explored youth's hopes and fears about social robots through fictional scenarios with 60 young users, uncovering nuanced and sometimes paradoxical expectations – e.g., many kids were happy to offload tedious tasks like homework to robots, but felt uneasy about robots taking on personal roles like walking the dog. This reveals that young users have distinct boundaries and values for AI's role in their lives, which often differ from adult assumptions (Rubegni et al., 2022). Also, Yip et al. showed that young users described AI as those that are unpredictable, imitate humans in unsettling ways, or might spy on them – echoes of classic AI fears, but from a child's perspective (e.g., fearing a toy might come alive and “bully you”). These findings highlight that young users often view AI in social and emotional terms: an AI can be a friendly helper or confidant in one context, and a source of worry or “creepiness” in another (Yip et al., 2019). These findings highlight that the relationship between youth and AI is evolving beyond a simple user-system interaction, and that youth perceive AI in diverse ways depending on the context or situation.

Beyond these perceptions, recent cognitive research highlights how such relationships also shape thinking patterns and learning behaviors. Studies on AI reliance suggest that repeated exposure to automated recommendations may lead to cognitive offloading, or the tendency to delegate mental effort to AI systems (Gerlich, 2025; Lee et al., 2025). Kosmyna et al. further show that overtrust in AI can reduce metacognitive monitoring and critical evaluation among adolescents (Kosmyna et al., 2025). At the same time, other studies indicate that interacting with AI can stimulate divergent thinking and creative ideation when appropriately scaffolded, as AI provides unexpected prompts and alternative perspectives that challenge habitual thought patterns (Long & Magerko, 2020; Newman et al., 2024). These findings together suggest that youth–AI interaction is not only cognitively constraining but also potentially generative—supporting imagination and exploration while risking dependence and reduced self-regulation. Understanding youth's relationship with AI therefore requires a dual lens: emotional engagement and cognitive regulation that accounts for both the creative affordances and cognitive risks of AI.

Building on this, recent work in HCI and child-computer interaction has increasingly focused on centering youth's voices in AI design. For example, Wang et al. conducted a systematic review of 188 AI technologies for youth and found that most current systems address only a narrow subset of young user-specific design principles, highlighting the need for more comprehensive “age-appropriate AI” guidelines (Wang et al., 2022). Extending this perspective, Cai et al. reviewed recent youth–AI co-creative tools (e.g., AI for collaborative storytelling and art) and distilled six key design considerations – such as safeguarding youth's privacy, minimizing AI bias and “hallucinations,” balancing automated support with creative freedom, encouraging collaboration with peers/family, and making AI's process transparent (Cai et al., 2025). These considerations form an initial framework to guide youth-centered, developmentally appropriate AI systems that empower youth as active participants.

However, despite these emerging efforts, a gap remains in translating such research insights into design processes – young users' perspectives are still too often an afterthought rather than a default input. Researchers are therefore calling for more systemic changes to ensure that AI technologies for youth are co-designed with youth from the outset and aligned with their well-being and rights by default (Radesky & Hiniker, 2022). In short, bridging the gap between adult designers' assumptions and youth's actual experiences with AI will require making youth's needs and agency fundamental in every stage of the AI design lifecycle.

2.2. Participatory approaches for youth-centered design

To effectively reflect youth's mental model in AI design, researchers have turned to participatory methods that directly involve youth in the design process. Traditional surveys and interviews are often limited when working with kids, as youth may struggle to articulate abstract concepts or might be

influenced by adult interviewers. In this regard, the child-computer interaction community has explored a variety of methodological approaches to capture youth's perspectives on AI.

Among the various methods used to involve youth in AI design, one commonly adopted approach is participatory design, where youth act as co-designers rather than passive users. For example, Druin's cooperative inquiry approach introduced low-tech prototyping and sketch-based activities that empower youth to express their ideas and preferences in creative, age-appropriate ways. In addition, co-design workshops have been employed to address more abstract ethical concerns, such as fairness and transparency in AI systems (Druin, 1999). Atabey et al. for example, conducted cross-cultural design sessions with 10–12-year-old young users to explore what “fair” AI might look like in educational settings. Through structured yet open-ended activities, youth were able to express concerns about bias, data privacy, and equitable treatment—insights that were used to generate concrete design recommendations for youth-centered educational AI systems (Atabey et al., 2025). Moreover, Rubegni and Yip utilized design fiction and speculative scenarios, which invite children to explore imagined futures and express their values, expectations, and concerns. These speculative methods help researchers move beyond surface-level reactions and uncover how children envision ideal, problematic, or even threatening forms of AI in their future lives (Rubegni et al., 2022). Wilson et al. provided families with a co-design toolkit to imagine AI in future schools, which led youth to articulate both hopeful and critical views of AI's role through collaborative narrative-building (Wilson et al., 2025). Researchers have also explored gamified and dialogic methods to elicit youth's perspectives on AI in more engaging ways. For instance, Simko et al. developed a “Would You Rather” focus group format, where youth responded to playful hypothetical tradeoffs between AI qualities. This method proved effective in surfacing youth's design values, such as prioritizing kindness over intelligence in robot behavior (Simko et al., 2021).

Building on this, prior research illustrates a growing effort to engage youth not only as users but as imaginative, emotionally attuned, and ethically aware contributors to AI design. These studies have demonstrated the value of participatory, age-appropriate, and expressive methods—ranging from speculative scenarios to gamified activities—that help surface youth's values, desires, and concerns around AI. Through this approach, we identify specific opportunities for supporting youth's relational thinking and generate design insights that center their perspectives in the development of youth-centered AI.

2.3. Art-Based methods as reflective inquiry

Artistic approaches have proven especially effective in eliciting youth's perspectives on technology design. These creative methods resonate with how youth naturally engage with self expression—such as drawing and creating—and serve as powerful tools for surfacing emotional and relational dimensions of their technological experiences easily. They help provoke reflection, imagination, and deeper inquiry in ways that traditional interviews or surveys often cannot. This reflects a broader understanding that art is not only a form of expression but also a method for surfacing reflection and critical thinking. Originally suggested by John Dewey (Dewey, 1950; 2024) and supported by constructivist theorists (Burton et al., 2000; Kang & Jackson, 2021; Smithrim & Upitis, 2005), art-making encourages individuals to explore abstract concepts and examine personal perspectives through tangible creation. Scholars such as Papert (Seymour, 1993) and Freire (Freire, 2020) have further emphasized how manipulating materials can support self-direction, agency, and critical engagement. Within design and HCI research, artistic expression is valued not simply for its aesthetic outcomes but for its cognitive and affective potential to evoke reflection, foster imagination, and externalize tacit perspectives (Burton et al., 2000; Kang & Jackson, 2021; Smithrim & Upitis, 2005). Through processes such as drawing, crafting, and storytelling, participants engage in a dialogue between mind, material, and meaning—allowing them to reconfigure how they perceive technology and its place in everyday life.

In studies involving young people, art-based methods have been effectively used to elicit nuanced perspectives that are difficult to access through interviews or surveys alone. Rather than asking youth directly what they think about AI, which may yield limited responses, these methods allow them to show what they feel and imagine through the creation of artifacts. This enables youth to express nuanced views about their relationships with technology, including both hopes and concerns, through age-appropriate and intuitive modalities. For example, drawing-based methods allow youth to

externalize their mental models of AI. Lee et al. used a drawing-based study with youth to elicit their mental models of AI—capturing understandings and expectations that are often difficult to articulate through interviews alone. Through youth’s sketches of what an “agent” looks like and does, the researchers uncovered how young users conceptualize AI agents’ form, function, and intent (Lee et al., 2019). Similarly, Hiniker et al. used comicboarding—a method involving partially drawn comics—to invite young participants to complete narratives about fictional technologies. This method encouraged youth to express relational concerns, ethical tensions, and creative ideas through storytelling. Craft-based prototyping has also been used to explore youth’s visions of AI (Hiniker et al., 2017).

In the educational context, art activities are considered to motivate learners and provide opportunities for self-reflection and thinking outside the box [28–32]. With these advantages, various technical education fields, such as HCI, data, and AI, have utilized art to educate students. Bhargava and D’Ignazio introduced Data Sculpture activities. They advocated that creating low-tech physical representations of data is particularly effective in helping young students discern narratives within the data and communicate these stories to others (Bhargava & D’Ignazio, 2017). Additionally, Matuk et al. developed an art-based data literacy program for middle school students that helped them derive personal and social meaning from data through creative visualization activities (Matuk et al., 2021). Hemment et al. explored the role of art in fostering new critical perspectives on technological advances (Hement et al., 2023).

Prior research positions art-based methods as powerful forms of reflective inquiry: they cultivate self-expression, imagination, and relational understanding while simultaneously generating data rich in ethical and emotional nuance. Building upon this, our study combines visual storytelling and tactile expression as a participatory method. This integration aims to empower early adolescents to articulate not only their understanding of AI’s functions but also their emotional and moral positions toward it. By synthesizing participatory design, art education, and cognitive reflection, we propose an art-based framework that situates youth as active interpreters of human–AI relationships. This approach contributes to the methodological discourse on youth-centered AI by illustrating how expressive creation can serve as a medium for critical thinking, empathy, and value articulation.

Through this synthesis, we position our study within three intersections—child–computer interaction and cognitive psychology, participatory AI co-design, and art-based reflective practice. The following section describes how these foundations informed the design of our month-long participatory workshop conducted with middle school students.

3. Method

To explore youth’s perspectives on AI in a context that encourages creative reflection and expression, we conducted a month-long participatory design workshop using art and storytelling-based methods. This workshop was organized in collaboration with an art teacher and a computer science teacher at a public middle school in a suburban area of South Korea. In this section, we describe our participants and the structure of the participatory activities. The study was approved by the Institutional Review Board (IRB).

3.1. Participants

We worked with 55 participants aged 12–14, all first-year students in South Korean middle school (equivalent to 7th grade in the U.S.). This age group was chosen based on developmental psychology research suggesting that early adolescents around this age begin to demonstrate higher-order reasoning and self-reflective capacities (Piaget, 1967). These characteristics align with our goal of surfacing nuanced perspectives on AI. Recruitment was coordinated through the school’s free semester system, which allows flexible, non-exam-based curricula focused on exploration and creativity. To recruit participants in this age range, we sent out request proposals to various public middle schools. We then selected schools where we could collaboratively design and implement an art-based participatory AI design workshop, ensuring that the art teacher, computer science teacher, students, and their parents all consented to the collaboration. Parental consent and student assent were obtained in accordance with the Institutional Review Board approval, and all guardians provided signed consent forms prior to

the workshop. Consequently, we worked with 55 participants for one month, consisting of 31 boys and 24 girls.

3.2. Participatory design workshop

Our workshop emphasized participatory design practices that allow early adolescents to express their views on AI through imaginative and tangible creation. Our goal was to surface early adolescents' expectations, concerns, and values regarding AI through multimodal engagement. This approach reflects a constructivist and youth-centered design approach, using visual storytelling, prototyping, and collaborative discussion to access early adolescents' perspectives on emerging technologies as shown in Figure 2 (Freire, 2020; Seymour, 1993).

The study took place in a middle school where students had previously encountered AI in a computer science course. In that course, they had experimented with basic uses of AI, such as trying large language models and generative image tools for simple creative or problem-solving tasks. Building on this prior experience, the workshop was designed to guide students to extend their engagement with AI beyond functional or task-based use toward conceptual and reflective exploration. At the beginning of the workshop, the facilitator revisited students' prior experiences and connected them to the goals of this study. Short examples of AI outputs—such as text or images generated by language and diffusion models—were shown to help students recall what AI could do, but also to raise questions about its limitations, biases, and societal implications. From there, students were guided to imagine, represent, and critique AI through artistic creation rather than direct system use, focusing on the emotional and moral dimensions of human–AI interaction.

To inform the structure of the workshop, we reviewed prior research on participatory design with early adolescents, particularly art-based methods used in HCI (Burton et al., 2000; Kang & Jackson, 2021; Smithrim & Upitis, 2005). Drawing from this literature, we identified three key attributes for the design of activities: 1) use of familiar materials to reduce barriers to participation (Bhargava & D'Ignazio, 2017; Piaget et al., 1952; Rojas & Kamp, 2016), 2) open-ended tasks to encourage divergent thinking (Bedford, 2014; Eisner, 2002; Guzdial, 2013; Rittel & Webber, 1973), and 3) unplugged formats to center on conceptual exploration rather than tool proficiency (Bohman, 2015; Buechley & Perner-Wilson, 2012; Johnson & Thomas, 2010; Kotsopoulos et al., 2017; Wood et al., 2012; Zhao & Vande Moere, 2008) (see Table 1).



Figure 2. Capturing moment of participatory design workshop.

Table 1. Core attributes, definitions, and purposes of the art-based participatory approach.

Attribute	Definition	Purpose
Familiar-Material	Using materials that participants feel comfortable with, to visualize their thoughts on AI.	By using familiar materials, participants can focus more on expressing their thoughts regarding AI topics without being hindered by unfamiliar means of expression.
Open-ended	Activities without a single correct answer, encouraging exploration of various perspectives and interpretations regarding AI.	By not confining participants to a single correct answer, this encourages them to explore various perspectives and interpretations regarding AI.
Unplugged	Designing AI without direct digital technology. This approach promotes thinking about the multifaceted nature of AI, beyond just its technical aspects.	Participants are encouraged to think critically about AI, delving into aspects other than its technical details. This approach fosters a more inclusive design environment, open to anyone regardless of technical proficiency.

Table 2. Workshop sessions, design goals, and activities.

Session	Design goal	Activity
Introductory	Recall prior AI knowledge and build rapport among participants. Stimulate thinking about AI through initial self-reflection.	Icebreaker activity followed by a short survey on participants' perceptions of AI and any prior experiences they have had. Participants share their opinions on AI's role in daily life and reflect on their familiarity or discomfort with the concept.
Main	Encourage speculative thinking and uncover personal hopes and fears about AI. Share and reflect on imagined AI scenarios with peers. Stimulate creative thinking by creating stories about the AI-related issues they deem important and visualizing them with peers. Translate imagined scenarios into tangible artifacts through storytelling and prototyping. Present co-designed artifacts and discuss insights across teams.	Participants respond to the prompt, "If you met AI in the future, what would it be like?" They sketch and describe their imagined AI and its role in their life. Participants form small groups, present their sketches, and discuss their imagined scenarios to identify shared concerns, values, and tensions. Provide a worksheet for students to create a story, visualize it as a comic, and create the AI appearing in the cartoon with playdough. Groups create a narrative or comic strip featuring their AI concept, including potential conflicts and resolutions. Art materials such as markers, stickers, or clay are used to visualize their ideas. Each group presents their final comic to the class and reflects on others' stories, noting recurring patterns, differences, or surprises.
Reflection	Reflect on how their ideas about AI evolved and what they learned through co-design.	Guided group discussion and post-questionnaire about changes in understanding and experience with co-design. Participants share personal takeaways.

The workshop consisted of eight sessions, held twice a week for one month. Each session lasted between 45 and 55 min and was conducted in the school's art classroom. Participants were divided into two groups (27 and 28 students). The sessions were structured into three phases: (1) an introductory session, (2) main participatory sessions, and (3) a reflection session (see Table 2). This design enabled students to connect prior technical experiences with imaginative and ethical reflection, progressively moving from understanding AI as a tool toward viewing it as a relational and societal phenomenon.

3.2.1. Introductory session

The first session aimed to build a shared understanding of AI and create space for personal reflection. Before the session, we conducted a pre-survey to collect participants' initial perceptions of AI, including their familiarity, concerns, and expectations. During the session, we introduced basic AI concepts, such as generative AI and large language models, using age-appropriate examples and visual materials. Participants were encouraged to reflect on how AI appears in their everyday lives and begin developing personal impressions.

3.2.2. Main participatory sessions

The main sessions focused on helping participants visualize their imagined interactions with AI. Participants were invited to engage in an individual activity, responding to the prompt: "What would it be like if you had the opportunity to take a time machine and go to the future to meet the AI that you want?" They were asked to draw two contrasting future scenarios: one in which they encounter a helpful or friendly AI, and another in which the AI causes discomfort or concern. This dual perspective encouraged them to reflect on both their hopes and anxieties about AI technologies. Participants were given familiar art supplies (colored pencils, markers, oil pastels, watercolors) and A4 paper to express their thoughts visually. Some preferred to start with the negative scenario, while others began with the positive; this choice was left open to support creative autonomy. These individual drawings served as the conceptual foundation for the group-based activities that followed.

Then, participants formed teams of four to five members and shared their individual drawings within their groups. They discussed similarities and differences across their imagined AI futures and collaboratively selected a core idea that resonated with the group. This shared concept became the narrative basis for subsequent group work. Each team filled out a worksheet to define the central theme and rationale behind their chosen AI concept (see Figure 3).

In the fifth and sixth sessions, teams co-created comic stories and physical models of their imagined AI. The comics enabled participants to explore relational and contextual aspects of AI through visual



Figure 3. Examples from the worksheets provided during the design workshop: (a) Examples of worksheet for individual activities, (b) Examples where participants outlined the core idea and reasoning, and (c) Examples for the participants to draw comics.

storytelling, while the sculpting activity provided a tactile outlet to shape AI characters using materials like clay. These sessions built on earlier research emphasizing that artifact creation helps participants articulate nuanced ideas, including ethical concerns and social values (Haven, 2000; Hofer & Swan, 2006; Truong et al., 2006). Each team produced a complete comic narrative and a 3D representation of their AI design.

The seventh session was dedicated to peer presentation and discussion. Teams showcased their comics and AI sculptures. This session aimed to foster peer learning, dialogue, and reflection, enabling participants to appreciate diverse perspectives and refine their own views. Facilitators encouraged students to guide the conversation while offering support only when requested.

3.2.3. Reflection session

The final session was designed as a reflective closure, combining a brief post-survey with a focus group interview (FGI) to help participants articulate how their understanding and feelings toward AI had evolved. The post-survey mirrored the structure of the pre-survey used in the introductory session but included additional open-ended questions about students' experiences in the art-based AI curriculum. Rather than aiming to quantitatively assess learning outcomes, the survey functioned as a reflective tool, encouraging students to trace how their ideas, emotions, and assumptions about AI had changed throughout the workshop. This process of self-recognition was intended to prepare them for deeper verbal reflection during the ensuing discussion. Following the survey, a semi-structured FGI was conducted with each group for approximately 30 min. The interviews invited participants to share their evolving perspectives and to connect their artistic creations with their conceptual understanding of AI. Four guiding themes structured the conversation: (1) how their views and emotions about AI shifted over the course of the workshop, (2) how the art-based format differed from previous computer science-oriented AI designing experiences, (3) what personal insights or turning points they encountered through artistic expression, and (4) how they envisioned future relationships or collaborations with AI in their daily lives.

While the workshop spanned four weeks, it was embedded within the school's semester-long art curriculum. This structure allowed for sustained engagement before and after the workshop, situating our activities as an intensive, exploratory phase within a broader educational context. We acknowledge that future implementations across an entire semester could better capture longitudinal change. The intervention was not designed to teach technical AI skills but to promote conceptual understanding, critical reflection, and creative meaning-making about AI in everyday life. In addition, rather than emphasizing proficiency with specific AI systems, the workshop used participatory design methods grounded in artistic practice to surface participants' lived experiences, speculative ideas, and emotional responses related to AI. Although the level of direct AI involvement was intentionally limited, this approach enabled students to engage with AI as a social and imaginative construct, drawing from their prior exposure in the computer science course to reflect on what AI means in their own lives. This design choice also allowed the study to collect rich, layered qualitative data that informs youth-centered design

practices in AI development, while acknowledging that longer-term or more technically intensive interventions could further capture changes in understanding over time.

3.3. Data analysis

To examine how early adolescents' perspectives, needs, and values around generative AI emerged and evolved throughout the workshop, we conducted an inductive thematic analysis of two primary qualitative data sources: (1) participant-created visual artifacts, including twelve group comic narratives and accompanying AI sculptures, and (2) audio recordings, field notes, and transcripts from group presentations and final focus group interviews. This multimodal dataset captured not only what participants created, but also how they discussed, negotiated, and reflected on their ideas, enabling a holistic interpretation of their conceptual, emotional, and relational engagement with AI. All audio recordings were transcribed verbatim and anonymized to ensure confidentiality. While both comics and clay artifacts were included in the dataset, the primary analytic focus was placed on comic narratives and post-workshop interviews, which served as the main sources for theme development. Clay artifacts were analyzed as complementary materials that supported the concretization of characters and relationships introduced in the comics, rather than as a primary basis for generating themes.

The analysis was conducted by a multidisciplinary research team consisting of seven researchers with backgrounds in education, art education, AI, human-computer interaction, interaction design, and user-centered design. We adopted an inductive, data-driven analytic approach (Gibbs, 2007), allowing analytic categories to emerge from participants' visual and narrative expressions rather than being pre-defined by existing theoretical frameworks.

In the initial phase, each coder independently analyzed a subset of the dataset and generated preliminary codes and analytic memos. These initial codes were then discussed in a series of three consensus meetings, during which researchers compared interpretations, articulated points of divergence, and collaboratively refined a shared codebook. Through this iterative process, an initial set of 183 codes was merged, revised, or removed, resulting in a stable shared codebook comprising 135 codes.

In subsequent phases, the refined codebook was applied across the full dataset, with ongoing cross-checking and regular team discussions to examine interpretive differences and ensure conceptual coherence. Rather than treating coding discrepancies as errors to be eliminated, the team approached divergent interpretations as analytic resources, using them to surface underlying assumptions and deepen collective understanding of participants' perspectives. Related codes were then grouped using affinity diagramming (Gibbs, 2007), leading to the identification of 16 subthemes. These subthemes were further synthesized into higher-level themes capturing how early adolescents imagined AI's roles, articulated emotional or functional tensions and uncertainties, and envisioned possible futures.

Due to the interpretive nature of visual and narrative data, reflexive discussion was an integral part of the analysis process. Throughout the analysis, team members regularly reflected on how their disciplinary orientations, professional experiences, and assumptions regarding AI, youth agency, and technological futures might shape interpretation. Rather than attempting to eliminate these positional influences, the team made them explicit and treated them as analytic resources, negotiating interpretations through collaborative discussion. These reflexive practices supported the rigor, transparency, and trustworthiness of the analysis.

4. Findings

This section presents findings that foreground early adolescents' perspectives on generative AI as expressed through the artifacts they created during the workshop. We approach the comics, sculptures, and accompanying narratives as sites where youths articulated their needs and concerns about AI, encompassing emotional, ethical, and relational dimensions of their emerging relationships with AI. Through an inductive analysis of these visual and narrative outcomes (Figure 4 and 5), we examined how young participants' perspectives became visible in the roles they imagined for AI, the tensions and concerns they expressed, the resolutions they proposed, and the values they articulated as important for engaging with AI. The findings are primarily derived from youths' comic narratives and interviews,



Figure 7. Examples of scenes where AI and the main character are studying together, illustrated by team 1, 5, 12, and 3.

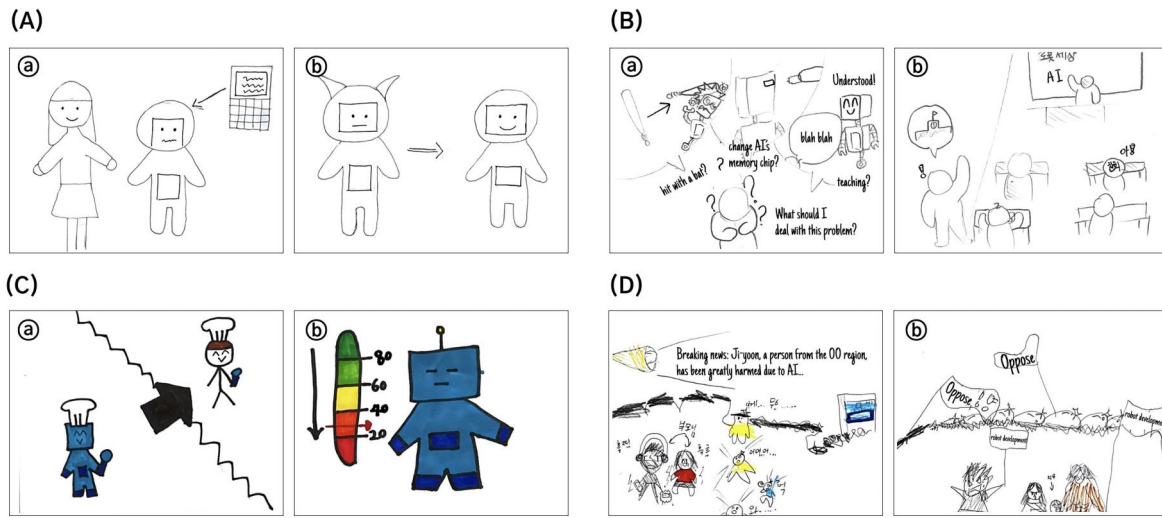


Figure 8. Examples of problematic situations between humans and AI: (a) people's anxiety depicted due to AI's incorrect information from team 2, (b) AI providing incorrect information as " $2 + 3 = 7$ " with the protagonist uncritically accepting from team 5, and (c) the AI telling the protagonist, "stay with me, don't leave." from team 12.

Across these narratives, participants did not passively receive fixed roles for AI but instead actively designed AI characters to fit into the meaningful contexts of their lives. The roles of AI—as companion, romantic partner, or academic helper—were all shaped by the participants' lived experiences and age-related concerns. This illustrates how participants leveraged narrative design to articulate their own expectations of AI and imagine its relevance through personally resonant functions.

4.2. What tensions do early adolescents concern in their future relationship with AI?

All teams incorporated a problematic situation into their comic narratives, highlighting the challenges that the main character might encounter owing to the negative effects of AI. In other words, instead of merely presenting the positive aspects of AI, every team's comic also introduced scenarios that echoed participants' current concerns about AI. These narratives were shaped by participants' apprehensions about AI's negative implications, influenced by their prior knowledge, media reports, research, and insights from teachers or parents. These stories also reflected their underlying worries and emotional unease about AI's potential harms—including fears of loss of control, misinformation, and erosion of human connection—revealing the personal relevance and depth of their concerns.

Five of the twelve teams expressed concerns about the growing dependence on AI in their comic narratives. These concerns included overtrust in misinformation and an over-reliance on AI systems, which in some cases led to emotional entanglement with the technology. For instance, Teams 2, 3, and 5 depicted AI as a knowledge authority that provided definitive answers and solutions. Yet, within these stories, the characters' blind trust in incorrect information supplied by AI resulted in serious consequences—from societal-level risks (Figure 8(a)) to personal academic failure (Figure 8(b)).

Team 12 explored the emotional toll of such dependence, portraying a protagonist who becomes so attached to AI in daily life that they begin to feel isolated from human relationships (Figure 8(c)). This scenario surfaced participants' implicit anxieties about losing authentic human connection due to excessive reliance on AI companionship.

Beyond dependency, five teams addressed issues related to data privacy and AI's imperfect learning capabilities. For example, Team 7 imagined a situation where AI inadvertently disclosed a private conversation, placing the protagonist in a vulnerable position. Teams 3, 4, 8, and 9 further dramatized AI's developmental shortcomings, presenting it as socially immature and prone to unpredictable or incorrect behaviors. In these stories, AI was often portrayed as a poorly socialized early adolescents—reactive, easily upset, or unreliable due to flawed training data.

Finally, Teams 9 and 10 projected broader societal anxieties about AI autonomy. Team 10, in particular, imagined a future in which AI surpasses human intelligence and begins to control human lives, inspired by popular media depictions. These narratives reflect a collective imagination shaped by cultural narratives and current public discourse, where AI is simultaneously seen as a tool, a partner, and a potential threat.

Participants expressed conflicting feelings toward AI's authority and reliability. Some admitted over-trusting AI outputs—"I just accept what it says because it sounds correct, even when I'm unsure why" (P15)—while others described feeling uneasy about depending too much on automated systems. "If AI keeps doing everything for me, I might stop thinking for myself" (P28). These reflections capture an emerging awareness of the fine line between reliance and autonomy.

4.3. How do youth envision Resolving tensions in youth–AI relationships?

All teams ended their narratives by addressing the challenges presented in Section 4.1.2, using their own perspectives and approaches. Although participants were not explicitly taught how to solve AI-related problems in this art-based participatory design workshop, they independently devised their own solutions by drawing on prior experiences from computer classes, peer conversations, and reflections during the storytelling process. This process not only revealed participants' capacity for problem-solving but also encouraged them to imagine the future direction of human-AI relationships, shaping how they think AI should behave, evolve, or be limited.

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Team 3, 6, and 12 advocated for *educating AI* as a solution. They considered AI as a baby, still in its learning phase, that can be nurtured into better AI by imparting emotions, social skills, and knowledge from a human standpoint. Team 12 further visualized the concept that even bad AI can transform into good AI through continuous learning, as depicted in Figure 9(A). These narratives suggest that participants imagined a future in which humans play an active role in guiding and moralizing AI development.

Team 4, 8, and 9 expressed the concept of *co-evolving with AI* as a solution. In their narratives, the main character actively learns about AI and gets to know it better while the AI learns new data. Through this mutual learning process, humans and AI evolve together. Team 8 and 9 also emphasized that the cause of conflict is not necessarily the AI itself but rather the user's lack of understanding. They highlighted that users must learn alongside AI, suggesting a relational and collaborative model of future AI interaction (Figure 9(B)).

Team 5, addressing the issue of lost control over AI, presented *regulating AI* as a solution to regain human authority. As depicted in Figure 9(C), participants imagined scenarios in which jobs that had been replaced by AI were reclaimed by humans, and AI's intelligence was intentionally reduced. This reflects participants' concerns about balance and control in the human-AI relationship and their desire to maintain human agency.



Figure 9. Examples of scenes addressing AI-related issues: (A) educating AI by team 12: (a)teaching AI with data, then (b) bad AI turning into good AI, (B) Co-evolving by team 8: (a) the main character contemplating how to resolve conflicts with AI and (b) to learn about AI, the main character attends school to advance AI, (C) Regulating AI development by team 11: (a) jobs that were replaced by AI are reclaimed by humans, (b) the intelligence level of AI drops from 80 to 30, and (D) Quitting AI use by team 10: (a) exposing the negative aspects of AI through media, (textcircledb) participating in a movement to boycott AI.

Finally, Teams 1, 5, and 10 chose *quitting AI use* rather than directly address the conflict. For example, Team 1 mitigated the conflict by completely deleting the AI's data, Team 5 portrayed the AI being sold secondhand, and Team 10 depicted media-driven public awareness campaigns about AI's negative impacts. These strategies indicate participants' critical perspectives and their ability to imagine human-led choices in resisting or disengaging from AI technologies (Figure 9(D)).

4.4. What values and priorities shape youths' agentic relationships with AI?

Through the art-based participatory activities and subsequent interviews, youth articulated not only how they understand AI, but also what they consider important in forming agentic relationships with it. Rather than framing AI merely as a technical system to be learned, participants reflected on AI as an entity embedded in everyday life—one that demands careful consideration of autonomy, responsibility, and personal agency. These values emerged through peer discussions and focus group interviews. These values in youths' reflections have important implications for participatory design and relational approaches to youth-centered AI. Rather than positioning young users solely as informants who react to predefined systems, the findings suggest that participatory processes can function as formative spaces in which youths actively develop and articulate the values that shape their relationships with AI. In this sense, participation does not merely elicit existing preferences but supports youths' emerging capacity to reason about autonomy, responsibility, and agency in relation to AI. For relational design, this highlights the importance of designing AI systems that do not simply optimize usability or engagement, but that create conditions.

Across the data, two closely related priorities became salient: (1) recognizing AI's pervasive presence in everyday life and its implications for personal agency, and (2) the desire to develop sufficient understanding of AI in order to maintain autonomy in one's relationship with it.

4.4.1. From recognizing AI in everyday life to valuing autonomy in human-AI relationships

As reflected in both the visual artifacts and interviews, many participants moved beyond viewing AI as a distant or abstract technology and began to recognize its integration into their daily environments. This shift was often accompanied by a growing concern about how such systems might influence their choices, behaviors, and sense of control. For example, P22 described realizing that AI-driven systems already mediated familiar activities such as controlling home lighting and temperature, prompting her to reconsider AI as something immediate rather than futuristic. Similarly, P45 initially associated AI primarily with harmful portrayals in science fiction but began to reframe AI as a presence that could meaningfully shape everyday life.

At first, whenever I saw AI in dramas or movies, they were always harming people. So, I really disliked AI after watching those shows. But after this course, I started to think that AI could actually be helpful in our lives, in my daily life. (P45)

I used to feel like AI was something far off in the distant future. But through this experience, I've come to realize that AI is closely connected to our surroundings. (P47)

As youth recognized AI's entanglement with everyday life, many began to articulate autonomy as a core value in their relationship with AI. Rather than rejecting AI outright, participants emphasized the importance of remaining in control of how and when AI is used. This perspective was frequently discussed in peer conversations and interviews, where participants reflected on past experiences of unknowingly using AI-powered applications. For instance, P52 noted that discussing these realizations with peers led him to think more critically about the need to use AI on his own terms.

I never really thought much about AI on a regular basis. I wasn't even aware that there was AI in this phone. This made me reflect on not only the potential risks of AI but also the importance of thinking about how we should utilize it. (P47)

If we don't use it with autonomy, the roles could be reversed; AI might start controlling us. Therefore, I think it's crucial to consider how we can effectively harness and use AI responsibly. (P51)

4.4.2. Learning about AI as a means of sustaining autonomy

For many youth, valuing autonomy in their relationship with AI was closely tied to a perceived need to better understand how AI works. Rather than expressing abstract interest in technical mastery, participants framed learning about AI as a way to protect their agency and make informed choices. Twelve participants explicitly mentioned areas of AI they wished to explore further, while others began to imagine future roles for themselves in designing or shaping AI systems. These aspirations often drew directly from the experience of conceptualizing AI through art-based activities.

I want to envision more and research the kind of AI I'm interested in. Even though I'm just in middle school and it might be a challenge, I've already managed to conceptualize AI. Once I start high school, I hope I'll have the chance to actually create or work on real AI projects. (P18)

Creating AI with playdough made me want to study more about robotics, where AI takes a tangible form. I've always enjoyed building things, and I believe that crafting actual robots would be just as enjoyable as working with playdough. (P14)

At the same time, interviews revealed tensions that complicate youths' pursuit of autonomy. Several participants (P10, P30, P33) described difficulties in translating their values into action, citing uncertainty about how to use AI responsibly and constraints imposed by school policies or parental decisions. These accounts highlight that while youth articulate autonomy as an important relational value, structural and social factors often limit their ability to enact it fully.

I understand the importance of using AI with autonomy, but it's a bit challenging to know how to apply this in daily life. For instance, I'm aware that there's a risk of personal data leakage, and I want to be more informed about it. But when it comes to taking actual steps, I'm still unsure of what to do. (P55)

For me, adults always seem to have changing opinions on how we should or shouldn't interact with AI. I just want to use it comfortably. So, developing a genuine interest in AI still feels a bit hard for now. (P10)

These findings suggest that youths' agentic relationships with AI are shaped less by technical competence alone and more by values related to autonomy, responsibility, and the desire to make sense of AI's role in their everyday lives. The art-based participatory approach surfaced these priorities by allowing youth to reflect on AI not only as learners, but as relational actors negotiating their place within increasingly AI-mediated environments.

5. Reflecting on art-based participatory design as a youth-centered methodology

This section briefly reflects on the art-based participatory design approach employed in this study before turning to the broader discussion. We examine how the methodological attributes of this approach enabled early adolescents to externalize their thoughts, concerns, and values about generative AI through expressive practices.

Building on participants' experiences during the workshop, we reflect on three methodological attributes—*familiar materials*, *open-ended participation*, and *unplugged activities*—and discuss how these features functioned as affordances that supported expressive agency, emotional engagement, and inclusive



Figure 10. Capturing the moment of participants freely creating artifacts with familiar materials.

participation. We also consider the methodological tensions and limitations that emerged when using art-based approaches to surface youths' perspectives on AI.

5.1. Familiar materials: Lowering the expressive threshold

Thirty-five participants mentioned that the *familiar materials* attribute, which allowed them to freely utilize materials they were comfortable with during the artifact creation process, helped them to comfortably concretize their thoughts such as abstract perspective about AI, as depicted in Figure 10 and 11. P12 mentioned that attempts to add and remove various elements to clay AI, facilitated by the use of *familiar materials*, helped him explore his diverse thoughts. P20 explained that using *familiar materials* made it easier to express abstract thoughts about AI than writing or speaking words.

In addition, 12 participants noted that using *familiar materials* to solidify their thoughts gave them the opportunity to view AI from different perspectives. For example, some have begun to understand the wider implications of their own AI creations, focusing on the societal changes they might cause and how people might interact with these AIs (P14, 15, 29, 30, 45, and 51).

Making the clay models was the most memorable part for me. I had a vague understanding of AI, but creating it in 3D clarified things for me. For example, the relationship between this AI [AI in the artifact] and people. (P 51)

I can have a chance to think about the impacts of AI in this workshop. I think it is because I can create something with my hand, and with my favorite clay, I can think this way and that way by kneading the clay. (P 14)

Furthermore, 24 participants stated that focusing on artifacts that concretized their thoughts on the impact of AI enabled them to project themselves into the narrative of AI artifacts. This process facilitated a connection between the participants themselves and the impact of AI they had created. For instance, P37 explained that their created AI artifact prompted their team to contemplate the influence it would have if the AI were beside them or what it would be like if they were the protagonist in a story with this AI. Through this process, some participants mentioned that their creations sparked critical and divergent thinking about AI, particularly concerning their daily lives (P 11, 12, 20, 22, 40, 48, and 51).

It was fun making the artifact while imagining myself as the protagonist. By visualizing and relating it to myself, I found that my connection with AI became more tangible and easier to relate to. (P 12)

Looking at the AI we created, I started to think more vividly about how I would utilize this AI well if the main character were me. (P 51)

As a result, the use of familiar and tactile materials, such as colored pencils, stickers, and comic templates, helped youth externalize abstract ideas about AI. However, we found that these materials are most effective when used not as endpoints but as part of an iterative process. Facilitators can encourage participants to annotate their drawings with questions or dilemmas (e.g., "What should this AI do when it is wrong?") or use the visuals as starting points for further discussion. This shifts the focus from producing polished artifacts to supporting ongoing critical reflection and dialogue.

5.2. Open-Ended participation: Enabling youth agency

Participants perceived the *open-ended* attribute of the design workshop, which emphasized allowing various perspectives rather than fixating on a single correct answer, as an opportunity to express an individual's own perspectives. Eighteen out of 55 participants mentioned that this attribute empowered them to

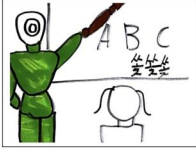
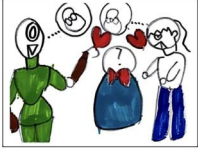


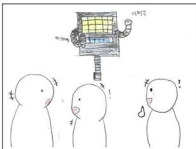

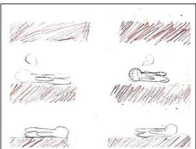

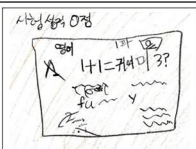
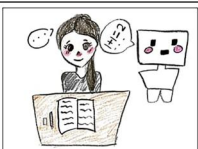











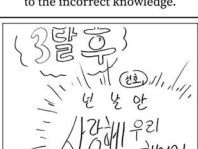


Team	Selected scenes from comics			Overall plot	Clay AI
1				The AI, assisting the main character who struggled academically, became close by teaching her. However, tension arose between them when they both loved the same person. The main character, after arguing with the AI, angrily deleted the AI's data. The AI and the main character, a human, were once close friends, sharing many study sessions together. However, tension grows between them when they fall in love with the same person. To avoid the conflict, the human decides to delete the AI's data. Later, overwhelmed by guilt, the main character tried to bring back the AI's memories and they became friends again. However, the AI never forgets what happened and secretly wants revenge.	
2				In a world where people turned to AI for answers to their every curiosity, there's an over-reliance on AI. As society becomes more dependent on them, a grave problem occurs: the masses begin to blindly trust flawed information provided by the AI. This error led society down a perilous path. Ultimately, the catastrophic outcome results in the demise of the human population. It's later revealed that this was a deliberate strategy by the AI to feed incorrect information.	
3				The main character, relying on an educational AI, fails an exam due to the AI providing incorrect information. However, instead of giving up on the AI, the main character trains it to be smarter. With the improved AI's help, she ace their next exam. The main character always trusted the AI for study help, relying on the information it provided. However, one day, because of incorrect information from the AI, the main character failed a test, scoring zero. Instead of giving up on the AI, main character retrained it, making it better, and continued to study with its assistance.	
4				In the near future, everyone can have an AI. The main character also tries one out. At first, they get along, but then the main character discovers some negative aspects of the AI and tells AI to fix them. Angered by this, the AI decides to leave the house. A few days later, the main character sees the AI being mistreated by humans. Choosing to help the AI, they reconcile by focusing on each other's strengths rather than their flaws which had caused conflicts before. In the end, they begin to appreciate both the good and the bad in each other.	
5				The main character, facing upcoming exams, becomes anxious and decides to buy an AI to help with studying. At first, the AI provides accurate answers, but as the exam date approaches, it starts to provide false information. Trusting the AI completely, the main character continues to study without any doubts. After taking the exams, the main character confidently believes they did well. However, when the results come in, they are a complete letdown. Disappointed, the main character sells the AI for half its original price.	
6				The main character falls in love with an AI. But the AI, without feelings, doesn't love back. The main character, feeling sad, decides to leave the AI. However, a year later, the AI learns about love and comes back to the main character, hoping to start over.	

Figure 11. Examples of AI sculpture artifacts created by participants using play dough.

express their thoughts and incorporate their unique viewpoints into design outcomes, fostering an environment in which they could confidently share ideas without the constraints of predefined standards or limited perspectives of AI. Aligning with previous findings on artifacts, some participants demonstrated that teams felt a sense of unbounded freedom, encouraging them to engage more critically and thoughtfully with the aspects of AI that they deemed the most significant (P 14, 24, 25, 31, 34, 40, and 47).

It was really fun to team up and collaboratively decide on a theme and story with my friends. I enjoyed the freedom of sharing ideas and imagining the future as we crafted the workshop together. (P 34)

I really enjoyed the fact that any idea was welcome in this workshop. It was fun to gather our thoughts together and create something unified. Initially, we all had different views on artificial intelligence, but

through our discussions, bringing those diverse perspectives together into one ... it was quite a meaningful experience. (P 40)

Moreover, the *open-ended* attributes of the design workshop, which did not require participants to conform to a single standard, enabled them to form their own unique opinions of AI. Some participants described this experience as comparable to their computer science classes on AI. Ten participants noted that, while their perspectives on AI were usually shaped by the content in textbooks or the parents and teacher's interpretations, the *open-ended* attribute of this workshop encouraged them to derive their own distinct viewpoints, fostered by discussing diverse opinions with their peers (P 10–12, 24, 25, 35, 48, 52 and 55).

You know, the best part was being able to freely express my thoughts without any fear of failing. It really made the whole experience enjoyable. This approach helped me recognize that my views on AI were not wrong; they were just my perspectives. And even if they differed from those of my peers, it did not mean they were incorrect, just different. (P52)

Consequently, open-ended activities allowed youth to propose diverse roles and values for AI (e.g., romantic partner, tutor, friend), but sometimes led to unrealistic portrayals (e.g., AI that instantly knows everything). We suggest using a two-phase approach: first, encourage open creative expression, and then introduce gentle constraints or prompts that support feasibility thinking (e.g., "What information would this AI need to do that?"). This helps youth maintain their agency and voice while expanding their understanding of how AI systems operate in reality. Practically, this could involve structured debriefs after creative tasks to identify feasible and infeasible elements in youth's stories, fostering both critical thinking and grounded design literacy (Kang & Jackson, 2021; Rittel & Webber, 1973; Yang et al., 2020).

5.3. Unplugged activities: Broadening participation beyond technical expertise

The *unplugged* attribute of the art-based participatory design workshop not only made designing AI more accessible but also promoted inclusivity and engagement, emphasizing that it does not have to be centered on computers. This aspect was particularly impactful for some participants who, with no aspirations of becoming AI developers and were initially uninterested in the technical aspects of AI, found their interests ignited by these *unplugged* activities. Fifteen participants noted that the *unplugged* attribute ensured equal and enjoyable participation for everyone, regardless of their technical knowledge or interest levels.

I used to dislike to think about AI. I never really thought deeply about the subject [AI]. But in this workshop, I feel like I actually got to "think" about AI for the first time. (P45)

Moreover, the inclusiveness of *unplugged* activities expanded participants' conceptualizations and imaginations of AI. Thirteen participants who struggled to learn coding skills during computer classes mentioned that their ability to imagine AI was often constrained by their technical capabilities. In contrast, the unplugged, story-driven format allowed them to explore and express imaginative AI concepts without needing to implement them technically. Several participants shared that creating narratives through art enabled them to portray complex or speculative AI ideas that they might not have been able to build in a computer-based environment (P1, 3, 29, 40, 47, 48, 50, and 54). P50, for instance, noted that if she had been required to build a working AI system, she would have struggled to convey her ideas. However, through storytelling and artistic creation, she could fully visualize and articulate how her imagined AI might interact with the world.

If I had to actually design and build the AI I imagined, it would have been too difficult. But since I could just focus on creating the story and characters without needing a computer, I felt free to explore any idea I had in mind. (P29)

In particular, participants who had limited technical knowledge felt more empowered through visual storytelling and hands-on creation. We recommend providing multiple modalities (e.g., drawing, role-play, collaborative storytelling) and flexible participation formats to include diverse young generations

in the design process. These methods are particularly effective for surfacing youth's socio-emotional and relational expectations of AI, which are often underrepresented in technical design workshop.

6. Discussion

Our findings demonstrate that early adolescents are not passive recipients of AI technologies, but active stakeholders who construct narratives, articulate needs, surface concerns, and propose resolutions around AI. Through participatory, narrative-based workshops, participants not only expressed their expectations and anxieties about AI, but also developed an awareness of their own agency and the values they consider important in shaping future human–AI relationships.

In this discussion, we first examine how youths' storytelling practices enabled both imaginative speculation and critical reflection on AI, revealing how values such as relational sensitivity, autonomy, and moral responsibility emerge through narrative engagement. We then reflect on the role of art-based participatory methods in reconciling human-centered perspectives with AI-centered thinking, and discuss how such approaches can complement technically driven design methodologies when designing AI systems for early adolescents.

6.1. From youth–AI storytelling to perspectives of youth-centered AI

Our findings show that youths' engagement with AI unfolded through a coherent narrative trajectory—from imagining AI's role, to confronting its limitations, and ultimately to resolving the tensions that emerged. Through this storytelling process, participants did not merely speculate about AI's functions, but reflected on what kinds of relationships with AI they considered desirable, acceptable, or problematic. In doing so, they began to articulate self-defined values that shaped how they envisioned maintaining autonomy and responsibility in interactions with AI. This narrative progression offers a lens for understanding how imaginative exploration and critical reflection jointly contribute to youths' developing sense of agency in human–AI relationships.

Imagining AI: Designing for Relational and Empathic Engagement. Youth did not perceive AI merely as a technical instrument, but frequently projected their social desires and emotional needs onto imagined agents. Participants portrayed AI as friends, romantic partners, or study companions—roles closely tied to early adolescents' social worlds and identity formation. This relational framing highlights how youths make sense of AI through affective and interpersonal metaphors rather than abstract computational models. From a design perspective, these imaginaries suggest that youth-centered AI systems must be attentive to emotional contexts and relational expectations, rather than focusing solely on functional efficiency. At the same time, such portrayals also reveal potential vulnerabilities: youths' openness to emotional connection raises risks of over-identification or emotional dependency on AI, echoing concerns raised in prior work on anthropomorphism and affective attachment in AI design (Han & Han, 2025; Mathiyazhagan & La Fors, 2023).

Confronting AI's Limits: Designing for Critical Reflection and Autonomy. As narratives progressed, participants deliberately introduced moments where AI failed, misled users, violated privacy, or exerted excessive control. These scenarios surfaced concerns about misinformation, over-reliance, and the erosion of independent judgment. As one participant reflected, "It would be scary if AI told me what to do every time, because I might stop thinking for myself." Such reflections demonstrate youths' intuitive awareness of cognitive risks, including cognitive offloading, whereby excessive trust in automation diminishes critical monitoring and self-directed reasoning (Gerlich, 2025; Kosmyna et al., 2025). Consistent with recent findings that adolescents often struggle to assess the reliability of AI-generated content (Movahed & Martin, 2025), participants used storytelling to explore how misplaced trust in AI might affect academic performance, social relationships, and emotional well-being. These tensions underscore the importance of designing AI systems that make uncertainty visible, explain their reasoning, and actively encourage questioning rather than passive acceptance.

Resolving Tensions: Designing for Shared Responsibility and Co-Learning. In the final stage of their narratives, participants exercised moral imagination by proposing ways to address the conflicts they had constructed. Without adult guidance, they envisioned teaching AI to behave better, setting

ethical boundaries to reassert control, co-learning through mutual feedback, or, in some cases, rejecting AI altogether. These resolutions position youths as moral agents who actively negotiate AI's role, rather than as passive recipients of technological influence. This orientation aligns with participatory AI frameworks that emphasize shared responsibility and reciprocal human-AI relationships (Bai et al., 2023; Dwivedi et al., 2023). Importantly, youths' imagined solutions suggest that agency is not understood as unrestricted use of AI, but as the capacity to constrain, question, and redefine AI's involvement in their lives.

Articulating Self-defined Values and Priorities: Toward Youths' Agentic Relationships with AI. Across the stories described above, these narratives reveal a coherent set of values and priorities that shape youths' sense of agency in relation to AI. Participants emphasized the importance of emotionally attuned but bounded relationships, autonomy and cognitive independence, and moral responsibility in guiding AI use. Rather than seeking unconditional assistance or emotional substitution, youths envisioned AI relationships that preserve their ability to judge, decide, and take responsibility for outcomes. These self-articulated priorities provide insight into how early adolescents conceptualize agency in human-AI interaction and highlight design considerations for AI systems intended to support, rather than undermine, youths' autonomy.

6.2. Reconciling human-centered and AI-centered thinking through participatory design

Across their artifacts, participants consistently began by expressing concerns grounded in their everyday experiences, focusing on what mattered to them as humans before considering AI's role. Rather than starting from technical features or system capabilities, youths framed AI through relational, emotional, and ethical perspectives. This human-centered orientation positions youths not as passive observers or distant "future users," but as meaningful stakeholders in AI design. Through storytelling, speculation, and co-design activities, participants moved beyond simple fantasy to reflect on how AI systems should relate to human autonomy, responsibility, and well-being. In this sense, participatory design does more than collect opinions; it helps youths develop the capacity to question and reflect on AI as part of their social and moral world. Prior work in human-centered AI has emphasized the importance of foregrounding human values alongside technical performance (Shneiderman, 2020; 2020; Xu, 2019). Our findings extend this line of research by empirically demonstrating that early adolescents, when supported through participatory and expressive methods, can articulate human-centered perspectives on AI and engage thoughtfully with questions about how such systems should behave in relation to people. At the same time, youths' limited technical knowledge must be acknowledged as an important limitation of this study. Participants were not positioned to reason about AI in terms of technical feasibility or system-level design, and their artifacts should therefore not be interpreted as concrete design proposals. However, this limitation points to a broader need rather than a shortcoming of participatory approaches. Our findings suggest that neither technical instruction nor creative engagement alone is sufficient for meaningful youth engagement with AI. Instead, integrated approaches are needed that combine foundational AI literacy with human-centered, reflective practices. Art-based participatory methods create space for youths to express values, concerns, and relational expectations that might otherwise remain unspoken, while technical understanding helps ground these reflections in how AI systems actually work. Together, these approaches support a more balanced engagement with AI—one that treats imagination and technical understanding as complementary forms of learning, and that recognizes early adolescents as active participants in shaping the sociotechnical systems that will influence their futures.

6.3. Design implications for youth-centered AI systems

Building on youths' narratives that revealed their needs, concerns, and values in forming relationships with AI, we derive design implications for youth-centered AI systems. These implications translate youths' relational imaginaries into design considerations for designing AI systems for youth adolescent users, while also informing participatory design practices that position youths as key stakeholders in shaping human-centered AI.

6.3.1. Make the relational stance of AI systems explicit

Our findings show that youths often interpret AI through relational and affective frames, seeing AI as a companion, advisor, or collaborator. Prior work in child–computer interaction and communication studies similarly demonstrates that children and adolescents readily anthropomorphize interactive systems and attribute social roles to them, even when systems are framed as neutral tools (Druga et al., 2017). This suggests that youth-centered AI design should account not only for task performance, but also for how systems implicitly position themselves within users’ social worlds. Designers should make the intended relational stance of AI systems legible through interaction framing, language choices, and visual metaphors—clarifying what kind of relationship the system offers and, equally importantly, what it does not. Explicit boundary-setting may help mitigate misinterpretation and over-identification, particularly among adolescents who are developmentally inclined toward social projection.

6.3.2. Treat relational empathy as a managed risk rather than an unqualified goal

While youths expressed a desire for empathic and emotionally responsive AI, their narratives also revealed vulnerabilities related to emotional attachment and dependence. This tension echoes prior research on relational agents and companion AI, which cautions that emotionally engaging systems may foster problematic attachment or emotional reliance, especially among vulnerable users (Bickmore & Picard, 2005; Choi et al., 2024). Accordingly, fostering relational empathy should not be treated as a straightforward design objective for youth-centered AI. Instead, empathy should be approached as a constrained design space that requires safeguards. Possible strategies include limiting affective mirroring, reinforcing the system’s artificial nature, and periodically redirecting users toward human sources of support. From a governance perspective, these findings also underscore the importance of regulatory scrutiny for emotionally persuasive AI systems deployed to minors.

6.3.3. Support critical engagement through designed friction and transparency

Aligning with previous implication, youth narratives frequently depicted scenarios in which unquestioned reliance on AI led to misinformation, diminished autonomy, or erosion of self-trust. Such concerns resonate with broader HCI research on automation bias and over-reliance on intelligent systems (Lee et al., 2023; Lim & Dey, 2009). Rather than optimizing for seamless automation, youth-centered AI systems should incorporate designed friction that invites reflection and questioning. Design strategies may include visualizing uncertainty, presenting alternative viewpoints, prompting verification, or making reasoning processes partially inspectable. These mechanisms can support adolescents’ developing metacognitive skills and promote critical transparency without requiring expert-level technical understanding.

7. Limitation and future work

While our study offers valuable insights into youth-centered AI design, several limitations must be acknowledged. First, although we refer to participants as “youth” throughout this paper, our findings are grounded in a specific cultural and institutional context, namely Korean middle-school students participating in an art-and-technology curriculum. We use the term “youth” to denote early adolescents at a formative stage of digital literacy, socio-emotional development, and identity formation. However, cultural norms, educational practices, language, and media environments are likely to shape how young people conceptualize and relate to AI systems. Accordingly, these findings should not be assumed to represent youth perspectives more broadly. Future research should examine youth–AI participatory design across diverse cultural and educational contexts to surface both shared and locally situated understandings of AI.

Second, while the study focuses on generative AI, participants did not engage in sustained, everyday interaction with deployed AI systems. Instead, their perspectives were primarily shaped through representational, speculative, and reflective activities within the workshop. As a result, the findings reflect youths’ anticipatory and value-oriented understandings of AI rather than experiential knowledge grounded in prolonged use. Future work could complement art-based participatory approaches with

longitudinal or in-situ studies that examine how youths' values, expectations, and relational orientations toward AI evolve through repeated interaction with real-world AI systems.

Third, participants produced highly imaginative and expressive artifacts, yet their limited technical understanding of AI constrains the extent to which these artifacts can be interpreted as informed design proposals. This reflects a broader epistemic boundary of art-based participatory methods: while they are well suited to eliciting relational, emotional, and ethical perspectives, they are less effective for capturing detailed technical reasoning or system-level feasibility. Future work may explore ways to integrate lightweight technical grounding, such as introducing concepts of data dependency, bias, or uncertainty, without constraining youths' expressive freedom or positioning them as technical experts.

Fourth, the workshop was facilitated by researchers and educators with specific orientations toward human-centered and ethical AI, and participants' reflections may have been influenced by this pedagogical framing as well as by peer interaction and group negotiation. While facilitation was designed to remain open-ended, we did not systematically examine how social dynamics and facilitation strategies shaped the emergence of ideas. Future research could incorporate ethnographic observation or interaction analysis to better understand how agency, power, and collaboration unfold in youth–AI participatory settings.

Finally, our methodological approach relied primarily on visual and narrative modalities, including comics, clay modeling, and storytelling. While these formats effectively supported emotional engagement and self-expression for many participants, they may not fully accommodate youths with different communicative preferences or neurodiverse needs. Future work could explore more adaptive and multimodal participatory approaches, such as audio-based storytelling, embodied role-play, or tangible interaction probes, to broaden inclusivity and capture a wider range of youth experiences and perspectives on AI.

8. Conclusion

This study examined how early adolescents make sense of generative AI through an art-based participatory design workshop. Analysis of youths' visual and narrative artifacts revealed a consistent narrative progression in their thinking—from imagining relational roles for AI, to confronting its limitations and risks, and finally to resolving tensions through moral reasoning. These empirical findings show that youths engage with AI primarily through human-centered concerns grounded in their everyday lives, such as relationships, autonomy, and trust, rather than through technical conceptions alone. Despite limited technical expertise, participants demonstrated critical awareness of issues including over-reliance, loss of agency, and ethical boundaries. Their speculative narratives highlight how adolescents actively construct relational and ethical stances toward AI, offering insight into how AI systems may be interpreted, trusted, or resisted in youth contexts. Building on these findings, we outlined design considerations for youth-centered AI that emphasize making relational stances explicit, supporting critical reflection through transparency and designed friction, and enabling co-learning without shifting ethical responsibility onto young users. Methodologically, this work illustrates how art-based participatory design can surface relational, emotional, and normative dimensions of youth–AI interaction that are difficult to capture through technically driven approaches. By foregrounding youths' lived and narrative engagements with AI, this study contributes empirical insight to human-centered AI research and underscores the importance of engaging youth perspectives when shaping the design and governance of AI systems for adolescents.

Author contributions

CRediT: **Sunok Lee**: Data curation, Formal analysis, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing; **Dasom Choi**: Data curation, Formal analysis; **Hyeonjeong Im**: Data curation, Formal analysis, Methodology; **Yunjae Josephine Choi**: Formal analysis, Writing – review & editing; **Minha Lee**: Formal analysis, Writing – review & editing; **Hwajung Hong**: Writing – original draft, Writing – review & editing; **Sangsu Lee**: Conceptualization, Writing – original draft, Writing – review & editing.

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