Exploring AI assisted pattern making in art and crafts education

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AI text-to-image generative technology has transformed how we can visualise. Access to such tools opens new learning opportunities that require development and a critical mindset. As part of an ongoing design-based research project in art, crafts, and design education, we are interested in learning about how AI can contribute to new insights or enhance students' creative learning processes. Previous research shows that AI-generated images can inspire creative processes, but few studies have included children and young people. This study explores how AI text-to-image generative technology can contribute to students' creative learning processes in a project that seeks to bridge digital and tactile experience. In this current study, we collaborated with a teacher to develop a project for Year 6 students (11–12 years old). The students generated patterns using Midjourney, printed them on adhesive vinyl, and attached them to silkscreens to create stencils for textile prints. Data was collected through the qualitative methods of participant observation and informal conversational interviews, conducted by three researchers who made individual observation notes. We further analysed the students' interactions with the AI and documented their work through photography. The results suggest that using AI-assisted pattern generation in combination with traditional silkscreen printing can foster student engagement, perseverance, and creative ownership.

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Introduction

Education and learning methods evolve in response to changes in society. For art, crafts, and design education to remain relevant in the future, the subject of art and crafts must provide a space for developing the knowledge and skills students need. Artificial Intelligence (AI) is already transforming society in many areas. Schools and teachers must address this, as it can bring fundamental changes to how we work and create. It can change both what we teach and how we teach it. Text-to-image generative technology has been evolving since 2014, with awareness increasing following the launch of DALL-E in 2021 (Cetinic & She, 2022). Development accelerated in 2022 with the launch of services such as Midjourney, OpenAI's DALL-E 2, Adobe Firefly, and Stable Diffusion. Since then, many more providers have entered the market, offering a wide range of standalone services—both paid and ad-funded—along with extended features in existing software. This rapid development necessitates a critical perspective on what the technology can offer and how best to utilise it.

In this context, there is a need to explore how this technology can be best adapted to creative learning processes that enhance students' learning outcomes in art, crafts, and design education. This includes its application across different disciplines, materials, and techniques. Much prior research has focused on the image-making process within text-to-image generative platforms. One concern raised (Ringvold et al., 2024) is that using this technology may reduce tactile experiences and sensorimotor capabilities.

In this study, we explore new ways of using AI text-to-image generative technology to uphold the tactile experiences that lie within creative learning processes in this subject. We ask: *How can AI text-to-image generative technology contribute to students' creative learning processes in a project that seeks to bridge digital and tactile experiences?*

This introduction will continue with a presentation of the concept of AI text-to-image generation and how AI competency is developed in education, before we present a literature review on the use of AI text-to-image generators in art and design processes.

Artificial Intelligence (AI) and text-to-image generation

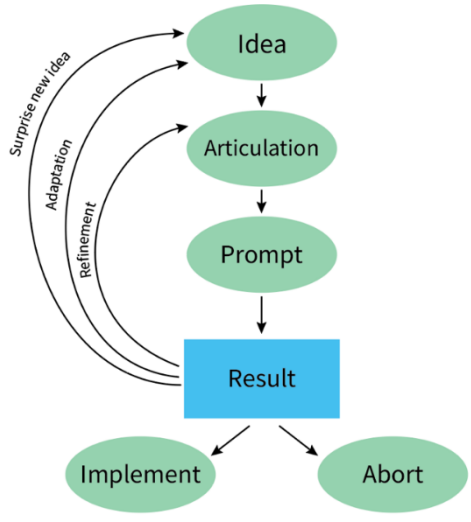
Numerous text-to-image generative models exist. They all generate images based on a user-provided prompt. The AI model interprets the prompt and generates one or more images. The output depends on the specific model and its training data. These models are trained on vast amounts of image-text pairs sourced from various databases and the internet (Abdallah & Estevéz, 2023; Hutson et al., 2024). With detailed prompts, users can specify motif, style, genre, format, mood, and other attributes.

Essentially, anyone can input a short prompt and receive a generated image. However, creating an image that aligns with the intended vision and accurately reflects the creator's idea requires more effort. Oppenlaender et al. (2024) argues that writing high-quality promts, or *prompt engineering*, is a new type of creative skill that must be acquired through practice and learning. A well-crafted prompt is descriptive, but users must experiment multiple times to familiarise themselves with the system's capabilities and limitations. Thus, the process of visualisation through text-to-image generators can be understood as cyclical and iterative. In our previous research on AI (Ringvold et al., 2023), we developed a model illustrating the process from idea to outcome (Figure 1).

The process begins with a visual, prefigurative idea (step 1), which is then articulated (step 2) and entered as a prompt (step 3). At this stage, a black box process (Bunge, 1963) occurs before the result emerges (step 4). The result is then subjected to evaluation. If it aligns with the original idea, it can be carried forward in the process (implement).

Figure 1.

The AI Image-Creating Process (Ringvold et al., 2023)



Often, however, changes are necessary, either in the linguistic articulation of the idea (refinement) or through adapting the original idea (adaptation) to increase the likelihood of a relevant result. In some cases, the result may be unexpected, leading to entirely new ideas (surprise new idea). If the result is unusable, it is discarded (abort). The AI image-creation process is rarely linear, often requiring the creator to repeat various steps or explore new pathways.

Artificial intelligence competency in education

The integration of AI in education raises important questions about teachers' control over and decision-making regarding its use. As AI technology continues to evolve, it is crucial for educators to be prepared to handle its complexities and challenges.

In 2024, UNESCO launched a global framework on AI competency for teachers (UNESCO, 2024b) alongside an AI competency framework for students (UNESCO, 2024a). The former aims to support teachers in their ongoing professional growth and learning, promoting a human-centered approach to integrating AI in education. This includes the teacher's ability to make well-considered decisions about when to use AI tools and which ones to select. AI has significant potential to enrich learning, beyond merely automating tasks or simplifying design processes.

The 2020 revision of the Norwegian curriculum promotes a more future-oriented education by integrating digital skills into all subjects (Norwegian Directorate for Education and Training, 2020). AI is included in an updated edition of *Professional Digital Competence Framework for Teachers in Norway* published by The Norwegian Directorate for Education and Training (Kelentrić et al., 2024). Other Nordic countries are also addressing AI´s relevance in education, drawing on UNESCOs AI Framework and The EU Artificial Intelligence Act, or AI Act (Regulation 2024/1689). In Finland, the National Agency for Education are developing a more detailed definition on AI literacy for education (Finnish National Agency for Education, 2025). Sweden published a report based on responses from 530 teachers, revealing that only a small number were using AI in schools at the time. The report highlights a significant need for support and training (Swedish National Agency for Education, 2024). Denmark has introduced a seven-step guidance framework for educational institutions (Ministry of Children and Education, 2025), while Iceland has launched an AI Action Plan (Ministry of Culture, Innovation and Higher Education, 2025) where evolving education is one of five basic pillars. As part of this initiative, the Icelandic government recently announced an AI education pilot program that will provide teachers with access to *Claude*, an AI assistant developed by Anthropic, a company specializing in AI safety and research (Anthropic, 2025).

AI competency is crucial in today's world (Kong et al., 2024; Regulation 2024/1689; UNESCO, 2024a, 2024b). This involves educating students to critically understand AI, its underlying concepts, and its applications in school and daily life to solve problems (Kong et al., 2024). The UNESCO AI Competency framework for teachers (UNESCO, 2024b) includes guidance for facilitating the creative use of generative AI in education and research. Although higher-order thinking and creativity have gained increasing attention in the definition of learning outcomes, the framework emphasises the importance of foundational skills such as writing, practice, and art. For art and crafts teachers, this means that traditional learning methods should not be viewed as outdated but rather revitalised and enhanced with generative AI technology.

The authors have encountered several challenges when using AI text-to-image generators in teaching contexts. Advanced models are often costly, and there are significant differences in image quality between free versions and paid tools such as Midjourney or DALL-E, both in terms of content and resolution. Free tools can include advertisements, and based on our experience, they often lead to content that is not suitable for children, such as sexual material (Ringvold et al., 2024).

Literature review

In this section, we present research on the use of AI text-to-image generators in art and design processes. These studies have mainly involved adult participants, as most of the educational research we have found has focused on developing students' AI competency through the use of ChatGPT (Castro et al., 2024), programming (Hanrui et al., 2024; von Wangenheim et al., 2021; Wonjin & Wanju, 2024), or working with machine learning (Sanusi et al., 2024) and robotics (Bellas et al., 2024; Hanrui et al., 2024). This highlights the need for further research on how younger students utilise AI technology in

their art and design processes. In the next section, we present the two studies we have identified in which lower secondary school students use text-to-image generators in art and design processes, followed by studies involving adult participants.

Vartiainen, Tedre, and Jormanainen (2023) conducted hands-on workshops in autumn 2022, aiming to help Year 8–9 students (14–16 years old) at a Finnish school understand AI from three different perspectives. This included learning about rule-based AI by programming robots, principles of supervised learning by training an AI, and how image-recognition systems and generative AI work. The latter of these, where the students worked in small teams to explore and experiment with Midjourney, was the focus of the article presented here (Vartiainen et al., 2023). The researchers noted that the classroom had a positive atmosphere and that students engaged in a free-flowing ideation process, encouraging one another to develop prompt ideas. The subsequent analysis of the outcomes was primarily an evaluation of how well the images matched the prompt, rather than a reflection on how prompts could be adapted or refined. Initially, students used terms from the examples provided but also experimented with terms derived from their own areas of knowledge, such as the style of a specific video game, or took inspiration from one another. Reflecting on the workshop, students generally agreed that making images with text-to-image generators was an enjoyable experience. Regarding ownership of the images, however, opinions were divided. One student stated that one must create images to be considered the creator, while another disagreed, viewing the process as one of co-creation (Vartiainen et al., 2023).

Heaton, Low, and Chen (2024) reflected on their experiences with integrating AI into art education in Singapore. In this presentation, we have chosen to focus on one of three sections of their paper. This section describes a project in which learners aged 14–15 used text-to-image generators in their ideation process to create physical paintings. The learners initially had negative perceptions of AI, believing that it could threaten their artistic autonomy or serve as a way to avoid creating their own artwork. However, despite these preconceptions, students found that using text-to-image generators enhanced their creative processes, as the ability to generate multiple images enriched their artistic exploration. The students worked with a complex topic—their feelings about organ donation—which the generated images allowed them to engage with more deeply. After trying AI, students were more positive and stated that it could support their creative processes. However, they emphasised that AI must be used appropriately and that personal expression had become even more significant when integrating AI into their creative workflow. The teacher also noted that students were more engaged due to the quick generation of visual ideas (Heaton et al., 2024).

Within product design and visual arts, the role of AI text-to-image generators in visualising ideas—particularly the impossible or what does not yet exist—has been highlighted by several studies (Abdallah & Estévez, 2023; Hutson & Lang, 2023; Ko et al., 2023; Lyu et al., 2022; Ringvold et al., 2023, 2024; Vartiainen & Tedre, 2023). AI-generated images are also highly detailed, even at an early stage of the ideation process (Abdallah & Estévez, 2023). One unique feature of AI text-to-image generators is their ability to rapidly generate images, making them a quick source of inspiration and reference material (Abdallah & Estévez, 2023; Ko et al., 2023; Liu et al., 2023; Mikkonen, 2023; Ringvold et al., 2023, 2024). This allows for significant visual variation at the ideation stage (Chen et al., 2019) and may help prevent design fixation (Liu et al., 2023). Hutson and Lang (2023) integrated AI text-to-image generators into a digital media course. Their students reported that AI helped them structure and visualise ideas, ultimately improving their final images. Another positive aspect of AI text-to-image generators is that they enable young children and individuals lacking visual skills to engage in image-making (Lyu et al., 2022; Ringvold et al., 2023, 2024; Vartiainen & Tedre, 2023). This is exemplified by the study of Lyu et al. (2022), in which both artists and non-artists generated images resembling oil paintings. The non-artists were enthusiastic about how AI text-to-image generators allowed them to

produce images they were satisfied with. The artists, on the other hand, held more negative perceptions (Lyu et al., 2022), as will be described further in the next section.

Previous research on AI text-to-image generators points at a broad range of negative aspects. The most prevalent of which is related to copyright issues, such as the use of copyrighted material in AI training datasets (Abdallah & Estévez, 2023; Mikkonen, 2023; Vartiainen & Tedre, 2023). There is also significant debate about who controls the creative process and outcome—the AI generator or the artist/designer using it (Abdallah & Estévez, 2023; Hutson & Lang, 2023; Liu et al., 2023; Lyu et al., 2022). The artists in Lyu et al.'s (2022) study reported a loss of control over the artistic process, while students in Hutson and Lang's (2023) study observed that their images all had a similar postcard-like aesthetic. Abdallah and Estévez (2023) found that AI-generated images often deviated from what creators had originally intended, as visualising highly specific ideas can be challenging. This is also something we have encountered in our own studies (Ringvold et al., 2023, 2024).

Conversely, vague ideas may present an equally significant challenge, as they can be difficult to translate into text-based prompts and require a time-consuming articulation process (Ko et al., 2020). Additionally, the lack of materiality in AI-generated imagery or the challenge of translating these images into 3D models has also been identified as a limitation (Abdallah & Estévez, 2023; Vartiainen & Tedre, 2023).

Research strategy and methods

In this section, we describe the research strategy for the overall educational design research project, as well as the methods of research and analysis used in this study. We also provide a description of participant recruitment and organisation of the workshop. Finally, we discuss the ethical considerations made in this study.

Educational design research

This study employs an educational design research strategy. It is part of a broader cyclical research project aimed at improving and developing educational design. Educational design research focuses on creating, implementing, and assessing innovative educational interventions within authentic learning environments. Its primary objective is to develop and document solutions to complex challenges in educational practice (McKenney & Reeves, 2018). Design cycles or iterations are considered central to design research (Bakker, 2018; McKenney & Reeves, 2018). Bakker (2018) describes these cycles as consisting of three phases: Phase 1: Preparation and design. Phase 2: Implementation (e.g. intervention, enactment, teaching experiment, trial). Phase 3: Analysis and redesign (Bakker, 2018, p. 59).

This study was a collaboration among five authors—four researchers and one teacher. The researchers currently work in university-level teacher education, and each have approximately ten years of teaching experience. Collectively, their experience spans all levels of education, from Year 4 (nine-year-olds) to university level. In this study, the teacher had the main responsibility for developing the project and educational materials. Three researchers participated in the workshop to collect empirical material and assisted the students in the analogue part of the process. All five authors have contributed to the writing of this article, in line with the Vancouver recommendations (ICMJE, 2025).

Participant recruitment and organisation of the workshop

The participants were recruited from the Year 6 class taught by one of the authors. Out of the full class, six students – two girls and four boys – were selected to participate in a separate workshop conducted in April 2024. The participants were selected by other teachers at the school, based on the students' interest in participating and practical concerns, such as which students would benefit from an alternative school day, or who would get along well with each other. This can therefore be described as a convenience sample (Bryman, 2016).

We did not ask about the students' prior experience with text-to-image generators, but they expressed that this was something they viewed as new and exciting. The teacher therefore started with a basic

introduction to AI generators and writing prompts. The workshop mainly took place over a full school day, from 08:30 to 14:00, and the students took breaks as needed. Not all students completed their projects, so they were given a few extra hours to finish them, as needed, a few days later. Three researchers, along with the teacher, were present throughout the workshop to supervise and provide hands-on assistance.

Although part of an ongoing, larger educational design research project, this specific study is small in scale, taking place over one and a half day and including only six participants. However, the aim of this study was to make an early exploration of how AI can be used in a project that seeks to bridge a digital and tactile experience, rather than to generate generalisable claims. As such, the study can be labelled as exploratory research (Davies, 2006; Swedberg, 2020). A small sample is sometimes used in exploratory studies, especially when researching new and less-known topics, as it is first necessary to see how the project will work on a small scale (Swedberg, 2020). For this study, one of the lessons learned was that some of the analogue elements were more challenging and time consuming than expected. This is something that requires further development before including a larger sample with a different student to adult ratio.

Observations and interviews

Data was primarily collected through qualitative methods, including participant observation and informal conversational interviews conducted both individually and in groups. Participant observation was chosen for its ability to provide first-hand, authentic data (Cohen et al., 2018). As all three researchers were engaging with the students throughout the workshop (about 8 hours in total), we got ample opportunity to discuss their processes and choices, and explore various practical and aesthetic solutions. This interactive approach during observation helped normalize the research setting, making participants more comfortable, as described by Bryman (2016) and Fangen (2004).

Informal conversational interviews were conducted as a natural extension of the observations, with questions emerging organically from the immediate context. This method was selected for its flexibility, allowing interviews to align with participants' experiences and the study's evolving circumstances (Bryman, 2016). Throughout the project, we asked students about their thoughts and actions, as well as the reasoning behind their creative choices. At the end of the project, we conducted an informal group interview with all six students. Lasting approximately 15 minutes, this discussion took place around a table, where students reflected on their experiences from the project, interactions with the AI, creative ownership, and their sense of proficiency in art and crafts.

To document our observations, we took individual observation notes both during and immediately after each session. These notes included direct observations, interpretations, and reconstructions of conversations with students. In some cases, the notes took form as jotted notes (Bryman, 2016) or *jottings*, other times narrated as episodes (Emerson et al., 2011). Additionally, all three researchers cross-checked each other's notes to verify accuracy and alignment with the observed events. We also photographed the students' work throughout the project and preserved logs of their interactions with the AI for further analysis.

Thematic analysis

Thematic analysis, as outlined by Braun and Clarke (2022), was employed to analyse the empirical material gathered from observations and interviews. The analysis was conducted collaboratively, with the research team organising the material based on similarities in content. Through this process, we identified themes that characterised the students' creative learning processes and examined how these were influenced using an AI text-to-image generator. The notes were then revisited and analysed through the lens of the emerging themes, allowing for deeper insight into the patterns within the data. The themes were further refined through a process of definition, renaming, and merging to ensure conceptual clarity and coherence (Braun & Clarke, 2022).

Ethical considerations

Studies directly involving participants is ripe with moral issues and ethical concerns, such as the participants' 'individual rights to dignity, privacy, confidentiality, and avoidance of harm' (Bresler, 1996, p. 135). Furthermore, children are considered as a vulnerable group that should only be included when it is necessary for answering the research question (Backe-Hansen, 2025). As we here ask how AI text-to-image generative technology affect students' creative learning processes, and there is a lack of studies including young students, we considered that it was important to conduct the study with participants of this age group. Thi requires special consideration, and we therefore consulted *Sikt – Norwegian Agency for Shared Services in Education and Research* when planning the study. As it can be discussed whether children under 15 have the competence to consent to sharing personal information (Backe-Hansen, 2025), we decided to refrain from collecting personal information on the participants. This meant that we wrote anonymised notes from the observations and interviews, rather than making video or audio recordings. Photos taken does not include identifying details or location data.

Furthermore, voluntary participation has been an important principle for us in this study. The students themselves could decide if they wanted to participate, after the project was presented by the teacher. During the project, we emphasised facilitating a fun and interesting experience for the students, by providing them close support while allowing them to explore freely. Through this, we sought for the study to benefit the participants not only in the future (Backe-Hansen, 2025), but also in the immediate experience. The educational project developed for this study will be described in the next section, before results are presented.

Artificial intelligence assisted patternmaking, a school project

To bridge the gap between the tactile world and the nature of AI, an educational design with a lesson plan was developed. In this school project, Year 6 students used generative AI to create stencil designs inspired by cultural heritage.

The participants were divided into two groups of three and introduced to the objective of the lesson: to create a stencil print using generative AI. Each group was given an iPad with access to the AI text-to-image generator Midjourney. First, the students explored the functionality of the technology, experimenting with self-chosen prompts in both Norwegian and English. They then refined their prompts to generate stencil patterns based on cultural heritage (Figure 2). The next step was to send the selected patterns to a Cricut machine, which printed and cut the designs on adhesive vinyl.

When designing the lesson, the teacher required an AI text-to-image generator capable of producing functional stencil designs while also being user-friendly for the students. As of early 2024, Midjourney was selected as the preferred model. Through extensive experimentation with different prompts in various languages and terminologies, the teacher discovered that the AI generator yielded the best results when prompted in English using discipline-specific terms. While Norwegian sixth graders generally have a solid grasp of English, some key terms essential for pattern generation were unfamiliar to them. These included *silhouette, stencil*, and *monoline*. Based on this, the teacher developed a 'dictionary' for students to use during the project.

The choice of the Cricut machine as the tool for transferring digital images into physical patterns was based on the goal of introducing students to unconventional tools. This provided an opportunity to learn how to operate new electronic machines within art and crafts education. As students had no prior experience with this machine, it was essential to establish an efficient learning method. Art and crafts education often involves close guidance, which can result in students passively waiting for help. To prevent this while working with the Cricut machine, the teacher developed a step-by-step manual with images of the process. This manual was printed and distributed to each group.

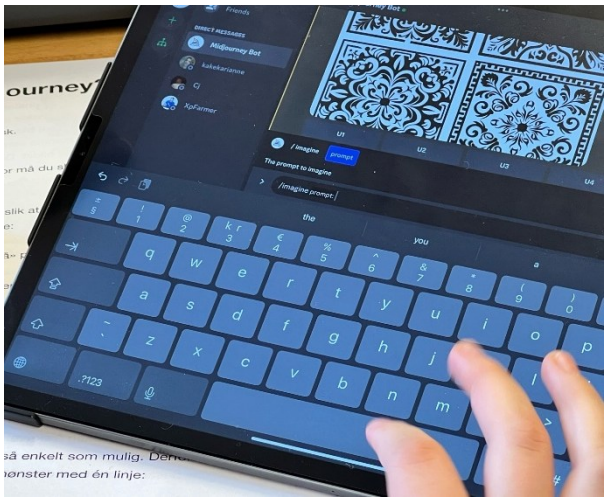
Once the Cricut machine had cut the design in vinyl, students had to determine which areas should receive the print colour: positive or negative print. To do this, they used a pointed weeding tool to pierce and remove vinyl pieces from the backing paper. After removing all excess pieces, students used a transfer sheet to move the vinyl stencil onto a silkscreen frame. This transfer sheet functioned similarly

to contact paper with strong adhesive properties, ensuring that all individual elements of the design remained in place during the transfer.

Finally, the students used the silkscreen frames for printing, first on paper for test prints and then on fabric. Those who had time also used the fabric to sew tote bags.

Figure 2.

Prompting patterns in Midjourney



Results and discussion

In this section, we present and discuss five themes identified in this study:

Awareness of subject terminology in prompting

Extended creative process to achieve a personal expression

Engagement leading to perseverance in practical work

Awareness of image-making proficiency, self-efficacy, and creative ownership

The importance of physical manifestations

Awareness of subject terminology in prompting

At the time of the study, Midjourney required precise terminology for effective prompting. In contrast, other AI services, such as ChatGPT, allow for a more conversational approach, making use of common language. This specificity required students to use discipline-specific terms introduced by the teacher, as described earlier. Although students were encouraged to experiment more freely with prompts as they progressed, they continued to rely on the terms listed in the teacher's dictionary. This aligns with findings from Vartiainen et al. (2023), who observed that participants primarily used example terms in their prompts and did not critically reflect on how to adapt or refine them for better results.

Using subject-specific terminology is a key component of disciplinary literacy and is frequently emphasised in curricula (Norwegian Directorate for Education and Training, 2020). Developing articulation skills—from prefigurative thought to written expression—can strengthen students' ability to convey ideas and enhance their visualising skills (Ringvold et al., 2023). The students in this study appeared highly literate in using the generator's interface, aligning with Prensky's (2001) concept of digital natives. Compared to our previous observations of adult first-time users, the students navigated the system with ease.

Extended creative process to achieve a personal expression

The teacher originally intended for the students to create patterns based on a specific national culture, and most students chose to work within this frame. They tended to choose a culture with which they had

a personal connection—through family background, frequent holiday destinations, or specific interests. However, two students took a different approach, basing their patterns on other cultural expressions. One student, passionate about Parkour—the acrobatic urban sport originating in Paris—developed a pattern inspired by it (Figure 3). His motivation was partly functional, as he intended to use his final product, a tote bag, for his Parkour training gear. Achieving the correct poses and figure proportions required multiple prompt revisions. Despite the challenges, the student remained highly focused and expressed satisfaction with the final textile print, eager to complete the project and start using the customised bag.

Figure 3.

The Parkour textile print in making

Across the group, generating patterns based on a specific culture allowed students to integrate personal interests into the designs. This personal connection seemed to enhance their motivation and sense of ownership over their work.

Based on our experiences as educators, young students often find it challenging to engage in extensive ideation phases. Many are eager to begin producing a final product and may struggle to explore multiple ideas (Kelley, 2017; Schut et al., 2017). However, in this study, we observed that students actively experimented with the AI generator, extending their ideation process. Students employed three primary approaches: *Testing different prompts to observe variations in results*, *generating patterns based on conceptual ideas to assess feasibility* and *refining variations of a selected idea to achieve the preferred depiction.* These three approaches can be seen in the process of a student who aimed to create a pattern inspired by Kanye West (Figures 4 and 5). The first prompt generated a range of images, including portraits and shoe designs. After experimenting with full-body images, the student shifted focus to a ghost motif inspired by one of West's songs. Finally, the student went back to the motif of West's face, where he worked to refine this pattern. Rather than settling on an early idea, the student continued generating variations, extending the ideation phase well beyond that of their peers.

Figure 4.

Developing the Kanye West design

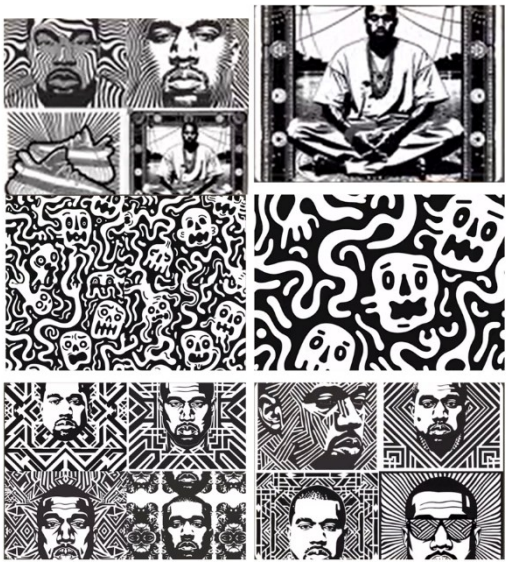


Figure 5.

The final Kanye West design and print

Similar to findings from Vartiainen et al. (2023) and Heaton et al. (2024), our participants exhibited a free flow of ideas and high engagement in the ideation process. While Heaton et al.'s (2024) students initially held negative perceptions of AI, they later acknowledged that it enhanced their creative processes. Comparable results have also been observed in studies involving adult participants (Chen et al., 2019; Hutson & Lang, 2023; Ko et al., 2023; Liu et al., 2023). These findings suggest that AI text-to-image generators support extended and varied ideation phases, which can help reduce design fixation. The rapid generation of images, coupled with the surprise element of AI output, likely contributed to students remaining engaged in this exploratory stage.

Engagement leading to perseverance in practical work

After the students had removed parts of the vinyl using a weeding tool (Figure 6), they transferred the motifs to the silkscreen frames using a transfer sheet. The sheet had to be thoroughly rubbed to allow

the vinyl to adhere before moving it onto the silkscreen frame (Figure 7). They then had to press the vinyl off the transfer sheet and onto the silkscreen—an unexpectedly challenging and time-consuming task.

The first difficulty was ensuring that the transfer sheet picked up the entire motif without leaving small vinyl pieces behind. To prevent this, students carefully lifted a small section of the sheet to check if the vinyl was sticking. If it did not, they placed the sheet back down and applied more pressure before attempting again. This repetitive process was necessary for many students, and the more intricate the pattern, the more challenging it became.

When transferring the stencil onto the silkscreen, new difficulties arose. The adhesive properties of the transfer sheet were stronger than those of the vinyl, making it hard for the design to stick to the screen. Additionally, the textured surface of the silkscreen prevented the vinyl from adhering easily. A circular process of rubbing, lifting, and checking followed, where students carefully tested whether the vinyl was transferring correctly. Initially, many found this frustrating, but as they gained experience, they made slow and steady progress. Sennett (2008) describes how musicians develop their skills by overcoming mistakes, learning through repetition and refinement. This concept applies here, as students engaged in a cycle of trial and error, gradually mastering the technique. They remained committed to the task despite its difficulties, demonstrating perseverance and resilience**.**

Figure 6.

Tedious vinyl work using the weeding tool

Some stencils were damaged during the process, requiring students to either repair them or adapt their designs. However, rather than becoming discouraged, students remained motivated**.** They saw their progress and recognised that problems could be overcome with effort. This aligns with Csikszentmihalyi et al.'s (2014) concept of emergent motivation, where engagement deepens as a task transitions from being unengaging to rewarding. The authors describe how "when the opportunities for action become clearer or the individual's skills improve, the activity begins to be interesting and, finally, enjoyable" (Csikszentmihalyi et al., 2014, p. 234)

Although some students needed occasional assistance from the teacher or researchers, they largely maintained control over the creative and making processes**.** The experience of working through difficulty, solving problems, and achieving a tangible outcome reinforced their engagement and sense of accomplishment.

Figure 7.

Transferring the vinyl stencil to the silkscreen

Awareness of image making proficiency, self-efficacy, and creative ownership

Some students expressed that they felt more proficient in image-making with generative AI than with traditional drawing techniques. They experienced a sense of mastery in the AI-driven process that they did not feel when drawing by hand. Bandura's (1997) theory of self-efficacy suggests that successfully accomplishing a task can enhance confidence and motivation. In this study, students demonstrated a higher level of visualisation proficiency than they typically achieved through traditional methods, which appeared to boost their confidence and encourage them to engage more freely in creative experimentation.

Generative AI allowed students to push the boundaries of their imagination in ways that might not have occurred through conventional drawing. The ease of generating multiple visual outputs lowered the threshold for participation, making students more willing to try, experiment, and refine their ideas. This aligns with Lowenfeld's (1975) observations that early adolescents—like those in this study—often become more self-critical of their artistic abilities. For students hesitant to engage in drawing-based creative processes, AI text-to-image generators can provide a useful entry point into visual expression. This is consistent with findings from Lyu et al. (2022), where non-artists benefited from AI-generated imagery in a way that made creative engagement more accessible. Similarly, in our study, students used AI to generate visual outputs they would otherwise have struggled to create.

One of the key reflections from our observations and dialogues with students was their perception of creative ownership. Some students took an active role in refining their AI-generated patterns**,** continuously modifying prompts to better match their vision. Others followed a more linear approach, selecting images without much revision. A few students initially questioned whether using AI to generate images felt like cheating, but they ultimately differentiated between using AI as a tool for ideation and merely copying existing images. They strongly emphasised that their active decision-making process shaped the final outcome**.**

Interestingly, several students, particularly the boys, stated that without AI, they would not have been able to produce such designs. This perspective suggests that AI functions as an enabler of creativity rather than a replacement for it. Similar to the findings of Vartiainen et al. (2023), students debated who "owns" an AI-generated image. While one participant in Vartiainen et al.'s study felt that she was not

the creator because she had not physically made the image, another student viewed the process as a co-creative collaboration between the user and the AI. In our study, students ultimately regarded AI as a tool that facilitated their creative process and enabled them to produce a final product they felt ownership over. The combination of AI-generated ideation and hands-on crafting strengthened their connection to their work**,** reinforcing both creative confidence and personal investment in the outcome.

The importance of physical manifestations

As students moved from AI-generated images on iPads to the meticulous precision of stencil-making after the Cricut cutting process, we observed a notable shift in pace and focus. During the AI-driven ideation phase, students engaged in collaborative discussions, exchanging ideas about multiple results and debating which words to use when prompting. They frequently referred to the teacher-provided dictionary, refining their prompts in response to peer feedback.

However, as they transitioned into physical stencil-making and silkscreen printing, the focus became more individualised. The process of transferring vinyl to silkscreens required careful manual adjustments, as small stencil pieces sometimes detached or shifted. Additionally, paint occasionally bled through the stencil, introducing unexpected variations, as seen in figure 5. Rather than viewing these as mistakes, students began to incorporate them into their designs, demonstrating an adaptable and problem-solving mindset**.** The shift from digital to physical materials reinforced their sense of authorship, as their work transformed from a digital experiment into a tangible product.

Students expressed pride in their final prints, eagerly anticipating the next session, where they hoped to sew tote bags from their printed textiles. What had started as just one of many AI-generated images had, through a lengthy and hands-on process, evolved into a unique, handcrafted print—something they were proud to call their own.

Conclusion

In this study our research question has been: How can AI text-to-image generative technology contribute to students' creative learning processes in a project that seeks to bridge digital and tactile experiences? The results suggest that using AI-assisted pattern generation in combination with traditional silkscreen printing can foster student engagement, perseverance, and creative ownership. Students demonstrated increased motivation as they refined their AI-generated patterns and transferred them onto textiles, overcoming technical challenges in the process. The project provided an opportunity for students who lacked confidence in their drawing skills, allowing them to produce high-quality visual expressions that they may not have achieved through traditional methods alone.

Furthermore, the iterative nature of AI-generated ideation seemed to encourage extended experimentation, allowing students to refine their artistic concepts before committing to a final design. The shift from digital to physical materials reinforced their sense of authorship and connection to their work. However, the study underscores the importance of guided instruction, particularly in developing critical digital literacy and prompt-engineering skills, as the students largely relied on copying the terms given by the teacher. Apart from this, there was little need for adult assistance during the AI idea-generation phase. Transferring the vinyl stencil to the silkscreen, on the other hand, required a lot of assistance from the adults. If adapting to a more typical educational setting with a larger group, changes to the design and lesson plan would be necessary.

Implications for future practice and research

Although limited in scope, this research project demonstrates how text-to-image generative AI can be meaningfully integrated into a learning environment. The project explores the use of generative AI as part of a creative process that culminates in a physical, tactile outcome. In future teaching applications, it is important to emphasize that the core of this learning design lies in the AI-supported ideation and pattern-generation process, rather than in any specific printing technique. The printing method itself can

be adapted to different contexts and levels of complexity, for example by using simpler techniques such as block printing or linocut. In this study, the patterns were transferred to a Cricut vinyl cutter, but they could equally be engraved into wooden blocks using a laser cutter, enabling block printing through a more straightforward production process. The study illustrates how generative AI can function as an integral component of a creative workflow that leads to an analogue outcome, and how the combination of digital and analogue processes can extend creative possibilities while fostering a sense of mastery and authorship.

Future research should further investigate how AI can be effectively implemented across different educational contexts while ensuring a balance between technological and hands-on making processes, preserving the material and sensorimotor dimensions of craft education.

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