The ARTificial revolution. Introducing generative artificial intelligence tools into artistic education

La revolució ARTificial. Introducció d'eines generatives d'intel·ligència artificial en l'educació artística

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Abstract

This article presents an experience of integrating generative artificial intelligence (AI) technologies in artistic education in the Primary School Teaching degree course. The aim of combining AI algorithms with traditional image editing techniques is not only to teach instrumental skills but also to foster a critical understanding of the limitations and risks associated with these technologies, promoting responsible and ethical use. The ability of AI to rapidly generate original content from text, images, video, and code, presents a complex landscape of opportunities and challenges. AI is redefining human cognitive processes and creativity, making it crucial to emphasise the importance of maintaining human intelligence as an irreplaceable complement to technology. The implementation of generative AI in art education not only enriches visual and aesthetic learning but also prepares students to contribute critically and creatively to the intersection of art and technology, equipping them with essential skills for innovation in their artistic practices.

Keywords

Artificial intelligence, content generator, creativity, art education, critical thinking, technology.

Resum

Aquest article exposa una experiència d'integració de les tecnologies d'intel·ligència artificial (IA) generativa en educació artística al grau de mestre d'educació primària. En combinar algorismes d'IA amb tècniques tradicionals d'edició d'imatges, es busca no sols aprendre habilitats instrumentals, sinó també fomentar una comprensió crítica de les limitacions i riscos associats a aquestes tecnologies, i promoure'n un ús responsable i ètic. La capacitat de la IA per a generar contingut original ràpidament, des de textos i imatges fins a vídeos i codis, presenta un panorama complex d'oportunitats i desafiaments. La IA està redefinint els processos cognitius humans i la creativitat, i és fonamental incidir en la importància de mantenir la intel·ligència humana com a complement irreemplaçable de la tecnologia. La implementació d'IA generativa en l'educació artística no sols enriqueix l'aprenentatge visual i estètic, sinó que també prepara l'alumnat per a contribuir críticament i creativament en la intersecció de l'art i la tecnologia, equipant-lo amb habilitats essencials per a la innovació en les seves pràctiques artístiques.

Paraules clau

Intel·ligència artificial, generador de continguts, creativitat, educació artística, pensament crític, tecnologia.

1. Introduction

The discourse on machines as creators, furthered by Benjamin (2018) concerning the loss of art's "aura" in the age of mechanical reproduction, has been significantly advanced with the advent of generative artificial intelligence (AI) in the realm of artistic creation. This technological progression calls into question traditional notions of art and authorship, leading to a reassessment of the creativity, authenticity, and aesthetic value inherent in AI-generated art. Generative AI effectively obfuscates the distinction between human and machine creativity, necessitating a revaluation of art definitions and the role of authorship and originality in the AI era. While AI facilitates broader access to art, its involvement in artistic production mandates a critical appraisal of art's value and significance within societal contexts. As technological advancements continue to redefine creative expression, discussions regarding innovation and human creativity in an increasingly digitised world gain critical importance. Historical shifts in artistic methodologies, such as CNC tools or photography, highlight the evolving dynamics of artistic creation and its gradual emancipation from technical prowess. Vartiainen and Tedre (2024) alongside Habbal, Ali and Abuzaraida (2024) accentuate the profound influence of AI on creative methodologies and underscore the imperative of the judicious use of technology.

Software, deeply embedded in contemporary everyday life, influences economic, cultural, creative and political aspects in both overt and imperceptibly subtle ways. The complexity of new technologies has opened new frontiers in human-machine interactions, developing a social dependence on mobile devices and social networks that nurture big data and, through deep learning, make AI the backbone of a media system primarily for marketing purposes (Dwivedi *et al.*, 2023). For decades, without full awareness, we have been subjected to analysis by AI tools that aim to predict our preferences based on our digital consumption habits. Deep neural networks that learn directly from our aesthetic choices have marked a turning point in AI's ability not only to describe and predict human behaviour, but also to create artefacts and simulate those behaviours, ushering in a new paradigm on a scale comparable to previous technological revolutions.

When AI is mentioned, it is often thought of as a single, homogeneous entity capable of autonomously performing complex tasks. However, this widespread view does not reflect the diversity and richness that characterise these tools. AI encompasses a wide range of models and systems designed with specific functions and objectives in mind. Each model is based on different principles and is designed to solve various problems, including prediction, content generation, classification, and natural language processing.

Table 1: AI models

Model	Description	Applications
Predictive	Uses historical data to make predictions about future events.	Weather forecasting, financial analysis, product recommendations.
Generative	Generates new data similar to training data.	Creation of images, video, text, music.
Classification	Identifies which category a new observation belongs to.	Image recognition, spam filtering, medical diagnosis.
Recommendation	Predicts user preferences and recommends products or services.	Streaming platforms, e-commerce, content services.
Anomaly detection	Identifies unusual patterns that do not conform to expected behaviour.	Fraud detection, health monitoring, predictive maintenance.
Decision	Assists in making complex decisions, based on a set of rules or strategies.	Expert systems, optimisation algorithms.
Regression	Estimates relationships between variables to predict a continuous quantity.	Estimation of relationships between variables.

Source: the author.

The significant progress of AI is mainly attributed to the generative applications that are now accessible to the general public through generative adversarial networks (GANs). Nguyen (2021) predicts that GANs will account for 10% of all generated data by 2025. The GAN architecture relies on two neural components: the discriminator network (D) and the generator network (G). The primary purpose of the G network is to generate new samples that imitate the domain of the original data, while the D network's objective is to distinguish between real samples (i.e., directly drawn from the original dataset) and fake samples (artificially generated by G). This training process is concurrent and competitive, promoting continuous enhancement in both models (Mulé *et al*., 2023). The process involves refining G to produce data that closely resembles real data, with the aim of deceiving D. Meanwhile, D evolves to identify the subtle differences between authentic and synthetic samples. This feedback loop ensures that the generation and discrimination of samples iteratively improve, resulting in the production of highly realistic synthetic data.

Among generative applications, the most advanced language model that has spurred the current AI frenzy is the generative pre-trained transformer (GPT). GPT was first introduced in 2018, and subsequent versions have been released, including GPT-2 (2019), GPT-3 (2020), GPT-3.5 (2022), GPT-4 (2023), and GPT-5 (2024), all developed by OpenAI. The processing technique behind these models is known as the transformer. In 2017, Google introduced a model that revolutionised natural language processing. The architecture relies on attention mechanisms to enhance contextual understanding of data. Compared to previous models that relied on linear sequences for data analysis, the transformer enables each element of the sequence to access any other element directly. This facilitates a more nuanced and comprehensive interpretation of the context and relationships between words or elements in a sequence (Bhandari *et al.*, 2023). Attention layers are used to weigh the relative importance of different parts of the input data. Its non-recurring design allows for faster and more efficient training by dynamically adapting to optimise information processing based on the specific context.

While AI has opened new creative opportunities for many artists, it also poses a threat to those who rely on their ability to deliver bespoke and high-quality work (Campbell, 2022). Illustrators may be particularly vulnerable to this threat (Barandy, 2022). Computer-generated imagery (CGI) technology, developed by the film industry, has been adopted to create deepfakes, which allow the creation of manipulated videos that look authentic thanks to algorithms that allow the embedding of third-party faces and voices into a video with hyper-realistic results (Montasari, 2024). It is important to note that advances in deepfake technology have changed the game in the creative industry by allowing people to be recreated in an extremely realistic way. Simply by providing the system with a set of images and a face, it learns to superimpose the face onto the images. The sophistication of fake content is such that the fictitious is almost indistinguishable from the real. It expands the creative possibilities of audiovisual media, but also facilitates the manipulation of reality (Nguyen *et al*., 2022). Its ability to deceive any viewer is so great that it can be used for malicious purposes, including creating hoaxes, fabricating news, committing fraud, and attacking the honour or reputation of a person, institution, or government (Buschow & Suhr, 2022). Deepfakes create the illusion that their subjects are doing or saying things they have never done or said, or participating in situations that have never occurred. To make matters worse, the technology used to create synthetic fakes is becoming increasingly accessible, so that today anyone can create artificial content without any special knowledge of CGI or digital retouching.

Deep lies do not represent a philosophical leap from simple lies (hoaxes). The psychological underpinnings of both are the same: people tend to believe and spread any lie that fits their prejudices; labelling something as a hoax does not prevent people from continuing to believe and spread it; the relentless repetition of a falsehood turns it into truth for uncritical audiences. A well-faked video, however, works even better than a written lie. After all, seeing is believing. Our confidence in our ability to distinguish real from fake videos lacks empirical support because we overestimate our ability to discriminate (Köbis *et al*., 2021).

As a result of the opportunities and threats posed by AI, an art education experience has been developed with the main aim of integrating generative AI as a new creative

tool for students. This is not a tool that avoids the need to think, however, but one that, taking an imaginative stance, uses technology from the perspective of the creator.

Learning to draw; educating the eye; understanding the basic aspects of composition, lighting, and colour treatment; and developing a library of visual references remain essential to the development of the ability to project ideas. Within the context of technical, material, and procedural knowledge, generative AI would be integrated as a means of expanding creative expression. Although we are still in an early stage, the significant impact that this technology is expected to have soon may modify aesthetic standards and visual communication, making it another relevant aspect to foster students' ability to identify and to interpret, on the basis of certain criteria and in a critical and sceptical manner, the artefacts created by generative AI. In addition to the artistic (interpretive and creative) approach, the third fundamental objective is to deal with the new medium with an educational focus, making it possible to foster a critical and responsible attitude in students who will become teachers in the future. This new medium should be integrated as a didactic tool that can be incorporated into their programming and used to create educational materials.

Future teachers need to be aware of generative AI to be able to integrate it as a creative and didactic tool. We deal below with an experience developed for the Art Education subject of the Primary School Teaching degree course. This experience aims to enhance the exploration and understanding of the fundamentals and applications of generative AI in the visual arts, thereby fostering creative experimentation and promoting critical thinking and media literacy in relation to the creation and consumption of AI-generated products. It seeks to cultivate skills among students to merge generative AI tools with traditional digital editing techniques so that they become aware of the creative possibilities that current technology offers, including image selection, advanced editing, and the integration of visual elements using open digital tools. This methodology is designed to elicit reflection on the significance of authorship and originality in creative endeavours involving AI, illustrating how it serves as a tool that requires human creative direction for the selection, manipulation, and final editing of images, thus emphasising the importance of maintaining creative

control over the process. Furthermore, this task serves as instrumental training for broader undertakings, promoting the development of artistic projects that effectively integrate generative AI. It encourages ongoing experimentation with new tools and techniques in generative AI, stimulating students to continually explore and learn about the emerging capabilities of technology in the field of visual arts.

This educational proposal aims to integrate technology to enrich creative and educational processes, promoting a deep understanding of its foundations and applications and the development of digital competencies necessary for effective use in artistic creation in various forms (visual, audiovisual, textual, and auditory). Additionally, it seeks to encourage artistic experimentation through the combination of generative AI with other traditional methods. This educational approach aims to promote critical thinking and media literacy among students. It fosters reflection on the social, ethical, and cultural impact of generative AI in the arts and develops skills for the informed critique of works generated by AI. The importance of an ethical perspective on artistic creation that recognises authorship, originality, and copyright is emphasised, while attention is given to the potential biases inherent in the technology and whether it is currently feasible to introduce it as a creative tool in basic education.

2. Needs analysis

One aspect that favours students' interest in subjects related to artistic education is their inclination towards visual communication, which makes them more receptive to digital resources and tools involving visual and audiovisual media. In general, apart from Chat GPT, they have not experimented with generative AI tools, as this is a rather unknown field.

3. Context

Today's Generation Z students are heavily influenced by entertainment and communication technologies, which shape their communication, interaction, and information-seeking behaviours. As digital natives, they excel in the intuitive use of technology, remote collaboration, and multitasking, yet struggle with concentration and sustained attention. However, exposure to a digital environment does not necessarily ensure advanced technical skills or digital literacy. Many individuals lack

proficiency in selecting information, audiovisual literacy, and technical skills for creating digital content. They often rely on pre-made filters instead of developing original content. Due to their accustomed immediacy, they face challenges in critical analysis and reasoned judgment. Additionally, there is a noticeable disregard for the ethical use of technology, highlighting the need for education that fosters responsibility and reflective consideration of one's digital actions. This experience was developed as an update to the digital module of the subject Visual and Plastic Education in Primary Education, which was compulsory in the Primary School Teaching degree course in the 2023-2024 academic year, with 68 students.

4. Proposal of the intervention or experience

One of the objectives of the didactics of artistic education is to familiarise teachers with the artistic creation processes. On the one hand, they can learn how artists work, how they research and strive to question the viewer and contrast the multiple interpretations offered by their works. On the other hand, it can help students to develop a more open attitude towards art and to participate more actively in contemporary culture. Based on the work of the photographer Joan Fontcuberta, students are asked to reflect on the veracity of images and to design and create a fake located on the Mundet campus, which before hosting the faculties of Education and Psychology was successively the temporary residence of the President of the Catalan Government during the Spanish Civil War, a Francoist concentration camp, a refuge for the homeless and an orphanage (Navarro & Torres, 2023). The fake, used by artists as a Trojan horse to challenge consciousness and rethink how we distinguish truth, blends narrative and aesthetics to test the viewer's credibility, mixing facts with inventions. In this process, evidence is created that seems truthful without revealing its fraudulent nature, forcing students to see the everyday differently and to question the credibility traditionally granted to photography, now viewed as susceptible to manipulation in the digital age.

This project is not new: it has been ongoing for three years. It provides an excellent opportunity to develop instrumental and creative skills in digital image editing using Gimp. The image is used as a discursive medium to construct narratives that go beyond aesthetics and the production of closed works. Instead, it generates proposals that

encourage debate and reflection. However, in the 2023-2024 academic year, generative AI technologies were incorporated as a creative tool.

The project was carried out in two phases. The first phase involved testing and understanding various generative AI tools and their integration into image creation. It was important to convey to students that these tools are not a panacea for instant solutions but rather that different operations must be worked on to obtain a good result. This approach helped us to achieve our goals with less time and technical effort. To conduct the task, the focus was on revisiting the "I was there" activity. The objective of this activity was to modify a photograph of a historical moment by including oneself (as seen in Fontcuberta's projects). However, in this experience participants were given the freedom to choose an image that represents their visual culture.

This project aims to delve into the principles and applications of generative AI in the visual arts, fostering creative experimentation and enhancing critical thinking and media literacy regarding AI-generated art. It seeks to endow students with the ability to merge generative AI with traditional editing skills, thereby broadening their understanding of the artistic opportunities that current technology presents. By focusing on image selection, editing, and the integration of visual components with open digital tools, the course encourages students to reflect on the role of authorship and originality in AI-involved art creation, emphasising the necessity of human oversight in the creative process. Furthermore, it prepares students for larger-scale projects by encouraging ongoing engagement with new generative AI tools and techniques, aiming to cultivate a proactive approach to discovering and leveraging the evolving tech landscape in visual arts.

The working process was as follows:

Once the image had been selected, the students had to find or create an image of themselves from a similar point of view as that of the image in order to insert themselves into it using the digital Face Swap tool from Pica AI (Figure 1).

Figure 1: Insertion of the face onto the original frame from *La La Land* by Damien Chazelle. Note: The image has been adapted from the Internet Movie Database (IMDB). *Source*: the author.

A first version of the characters was then created using the Adobe Express tool for removing image backgrounds, which had to be tweaked several times in Gimp to ensure an optimal result. If the background had many elements with similar tonalities and lighting to the characters, the AI sometimes did not recognise them correctly. Using Adobe Firefly's "text to image" generation tool, they had to imagine a new background in which to reposition the characters in a way that was surprising while maintaining visual logic. They also had to consider the formal elements of the image so that the overlay would fit properly. After writing the prompt and specifying a number of stylistic features, the programme generates four images for the user to choose from or instructs him or her to create new alternatives based on the image that comes

closest to what was intended. This makes it possible to introduce new specific modifications into the chosen image (Figure 2).

Figure 2: Cutting out the characters and creating the background, first of the landscape and then of the rope. *Source*: the author.

The next step was to merge the characters, adjusting their scale to the background using Gimp and converting the image to greyscale mode to make it easier to adjust the values of both images for a better overlay, focusing only on the luminance values of brightness and contrast. Using the My Heritage "In colour" tool, the AI recoloured the image to obtain a more homogeneous result, with similar temperature and saturation. Likewise, as in all phases, the result generated by the AI was retouched with Gimp to adapt it to the desired result; in Figure 3 you can see how the yellow colour has disappeared with the "In colour" tool. Finally, Wall-e 2 from Open AI was used to extend the field and canvas of the image with text. The final image was achieved by experimenting with generative AI tools combined with traditional digital editing.
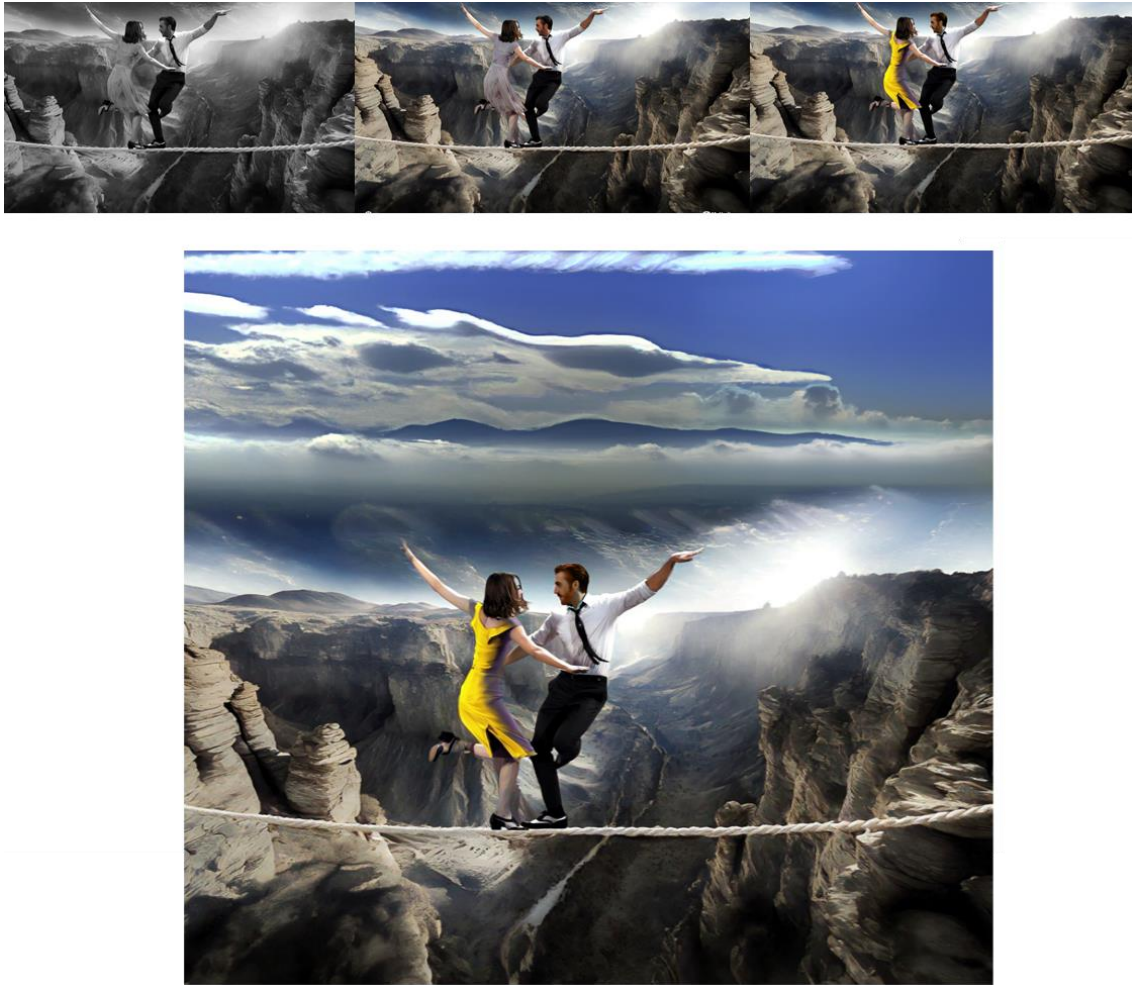
Figure 3: Embedding of the characters into the background, recoloration, and enlargement of the image canvas. *Source*: the author.

This task served as instrumental training to practice with different generative AI tools, which the students subsequently had to use to create the images in the *Fake Mundet* project (Torres-Carceller, 2022).

5. Results

As a result of the experience, the students developed a broad understanding of the creative application of AI in the arts, which enhanced their critical thinking and media literacy. This enabled them to evaluate the content generated by generative AI and understand ethical dilemmas such as copyright and plagiarism. They also recognised these technologies as a means, not an end. It was understood that technology facilitates the materialisation of ideas, but does not replace the need for basic knowledge and artistic skills.

However, during the implementation of the project, it was noted that some of the students tended not to question the results provided by the AI and found it difficult to assume their role as creators rather than mere recipients of generations. This observation underlined the importance of focusing on empowering future teachers as creative individuals who use technology as a means to facilitate the embodiment of their ideas, rather than as passive and uncritical recipients. The need to strengthen students' perceptions of their ability to interact with AI in a critical and creative way became a crucial aspect of the educational process, emphasising the responsibility of educators to cultivate a deep understanding of the active role they must assume in the face of advanced technology.

The training of future educators focused on the teaching and critical evaluation of these tools, ensuring that technology was used as a means of enriching the creative and educational experience, thus preparing a society that uses technology in an ethical and responsible way. The introduction of generative AI provided first-hand knowledge of the potential of the new technology and also of its most obvious dangers (media manipulation). This first contact – for most of the students – with these technologies allowed them to reflect on the great impact they could have on education in a very short time, implying an uncertain transformation that will force them to rethink current models and perhaps place less emphasis on technical aspects, focusing on activities that encourage reflection, analysis, and thinking to prepare future people capable of communicating effectively, accurately, and clearly what they want the machine to do.

6. Conclusions and discussion

Advances in artificial intelligence present a complex landscape of opportunities, limitations, and threats. Given the scale of advances in content creation, it is imperative to examine these new developments and their potential impact on society. The Internet has profoundly altered human cognitive processes by changing the way we access, create, and communicate data. In the long term, artificial intelligence is likely to bring about a similar transformation, with uncertain consequences. We must

therefore work to ensure that AI becomes a powerful tool that complements our thinking but never replaces it.

Another key aspect is the need to redefine the concept of authorship and to adapt it to the new paradigm, even introducing hybrid terms where some credit could be given to the technology itself, considering that in many cases the images generated by AI are the result of a collaborative process between humans and machines (created by humans). It is the human who provides the data and guidelines for the AI to generate the image, and then selects and edits the AI-generated images to create the final product. In this scenario, authorship could be attributed to the humans who provided the data and oversaw the process, although AI also played a significant role in the creative process. The introduction of generative AI can provide art students with a deeper understanding of design principles, visual narrative, and aesthetics by allowing them to intuitively manipulate visual elements and receive immediate feedback on the creative process. At the same time, the process of working with AI challenges students to articulate their creative intentions precisely, encouraging the development of critical and analytical skills. To ensure a democratic society, it is crucial to integrate artificial intelligence tools into basic education in a critical and reflective way. These tools should be embraced as resources that facilitate the materialisation of ideas rather than as a substitute for ideas themselves. They should be used to enhance imagination, not replace it.

Integrating generative AI tools into arts education is essential to foster creativity, not only to inspire students to explore new artistic territories and techniques but also to enhance their learning experience. By interacting with AI, students receive immediate feedback, enabling a deeper understanding of their artistic choices and facilitating rapid mastery of complex concepts and skills. Moreover, as technology and the arts become increasingly intertwined, students who can use AI for creative purposes will be better prepared for future careers, combining artistic sensibilities with technological skills. Generative AI tools democratise art education by making art creation more accessible to students who lack traditional resources, ensuring that creativity is within reach for everyone, regardless of background. In addition, the use of AI in the creative process encourages students to critically evaluate the role of technology in art,

teaching them to balance human creativity with technological tools and to consider the ethical and philosophical questions that arise from the integration of AI into society.

The introduction of generative AI tools to university students has provided them with an opportunity to experience the technology firsthand. This experience often leads to surprise at the potential of AI and the speed with which results can be achieved. However, this rapidity poses a significant danger. Due to the high volume of work and, at times, a nonconformist attitude, students may accept the results provided by AI uncritically, without understanding that it is merely a tool that facilitates rather than completes the work of generation or editing. Therefore, the initial idea and objectives of what they aim to achieve must originate from the students themselves. The use of AI has sparked a debate on the potential dangers of its development, including whether it should be limited and how it could be integrated into basic education. This integration prompts a revaluation of the teaching-learning process, considering the increasing power of these tools. It is acknowledged that maintaining creative control requires knowledge of artistic subjects to use AI based on creative criteria. This ensures that the machine responds to our will rather than relying on random outcomes and becoming servants to the machine's serendipity. This debate highlights the need for a balanced approach to integrating AI in education. It is important to cultivate a thorough comprehension of the capabilities and limitations of AI among students. This will enable them to use AI as a tool to enhance their creativity rather than as a replacement for it. Educators can play a crucial role in guiding students through the intricate terrain of technological advancements, empowering them to use AI responsibly and creatively in their future careers.

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