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# Applications of Invisible and Generative Artificial Intelligence in Developing and Assessing Visual Projects in Higher Education

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**Abstract:** *The present study examines how teachers in higher education can integrate invisible and generative artificial intelligence (AI) in visual communication classes, with focus on both its transformative potential and unavoidable pedagogical challenges. As AI tools such as Adobe Firefly, Midjourney, and DALL·E have been reshaping design processes, educators are put in the position to rethink the manner in which visual communication is taught, learned, and assessed. With this in mind, we propose a theoretical and pedagogical framework that addresses the complex nature of AI usage in visual communication education. By combining AI integration with educational theories, we believe that our analysis manages to offer an instrument for fostering critical reflection, aesthetic sensitivity, and conceptual clarity among students. The article analyses the importance of maintaining a balance between technological fluency and fundamental design principles. Educators in this field are recommended to nurture creativity, ethical awareness, and originality, while avoiding the over-usage of automated processes. In this regard, we propose an example of an evaluation grid that could be used in assessing AI-assisted design projects, considering factors such as conceptual depth, aesthetic quality, process transparency, and ethical sensitivity. Last, but not least, we suggest that process build on co-creation could enhance, rather than replace, human creativity. We believe this approach could offer future professional communicators the necessary tools to evolve in the intricate landscape of creative industries.*

**Keywords:** *digital design education; aesthetic education; visual communication; AI design; creativity.*

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## Introduction

The increasing usage of artificial intelligence has massively transformed visual communication in the digital medium. As design tasks increasingly involve AI tools—both invisible (embedded within software) and generative (producing original content)—educators must rethink traditional pedagogical models. Due to the specificity of visual communication, from the personal to the socio-cultural perspective, the current moment requires more than skill acquisition; it demands visual culture, aesthetic education, ethical literacy, conceptual clarity, and adaptive creativity.

Recently, largely adopted digital tools such as Adobe Firefly, Midjourney or DALL-E have enabled users to generate complex visuals materials based on simple linguistic prompts. At the same time, major design applications like Adobe Creative Cloud, Canva, and Figma have been integrating so-called invisible AI functionalities in order to increase speed and efficiency by process automation. All these innovations raise several fundamental questions: Who is the author of the generated content? Do we still have an original creative process? What implications these changes have for educators in visual communication studies?

The article analyses the importance of maintaining a balance between technological fluency and fundamental design principles, while integrating these innovations at their highest capacity. We will further present a theoretical framework for understanding the usage of AI in visual communication education, and then try to offer some specific recommendations for educators in this field.

## The implications of using AI tools in digital design education

In a broad sense, digital design represents a process of communication through images, employing specific techniques of production and editing to create visual compositions with aesthetic, stylistic, and strategic or functional attributes. Visual design utilizes various digital technologies to generate content by employing specific elements (space, shapes, colours, textures, typography, graphics, images, pictograms, symbols) and principles of composition (proportion, balance, contrast, hierarchy, rhythm, emphasis, etc.) (Dabner, 2005, 10–22; Samara, 2020, 18–25).

One of the particularities of digital design content is that it is created in accordance with specific needs or desires of the designer. Thus, it is a process that not only requires technical competences, but also a high level of creativity and aesthetic sensibility (El-Murad, West, 2004). Effective design

must be aesthetically pleasing and contain distinctive visual elements. Every design element must be carefully chosen to ensure usability and to convey the intended message in an appealing, coherent, and impactful manner.

Visual design involves several stages: design brief, research, concept, creation, design review, approval, and testing (Bowers, 2012; Aspelund, 2014; Sherin, 2023). Creativity is a defining factor in at least three of these stages. In the research stage, the project's objectives are defined, and strategic and creative decisions are established, including promotion and distribution methods, as well as the functionality of the final product, insofar as it is intended to fulfil certain needs of the target audience. Furthermore, the research stage clarifies the ethical norms regarding the creation and distribution of the product and, very importantly, issues concerning copyright.

In the second stage, conceptualization, the subject of the visual content to be created is determined, and different design variants are sketched. Sherin underlinethe importance of a few key creative elements at this design level: she mentions brainstorming, idea development, and experimentation. (Sherin, 2023, 44–45). Additionally, respecting visual identity requirements and a balance between graphic design approach and aesthetic vision also have a significant contribution in this phase, in order to maximize the customization of the visual content.

The most complex stage of the design process is, of course, the actual creation phase, which involves developing, adjusting, and refining design ideas. Originality, expressiveness, aesthetic quality, and stylization are defining attributes of creative visual design. The creation phase represents a specific mode of graphic organization and aesthetic presentation of the compositional elements of a visual material, such that the visual content aligns with the intended objectives for which it was created (Sherin, 2023; Inglis, 2023; Bowers, 2012).

Regardless of the domain in which it is applied, from visual arts to marketing, digital design is a complex activity that, in order to efficiently go through the aforementioned stages, requires a wide range of attributes and competencies: knowledge of design, visual and aesthetic education, creativity, aesthetic sense, aesthetic sensibility, and knowledge of marketing and communication. In other words, the design process follows not only rules of graphic composition and aesthetic presentation, but also principles of marketing and communication psychology. This way, it increases the chances to attract attention and generatethe desired emotional responses from the target audience (Landa, 2021; Altstiel et al., 2019).

As Nico Macdonald emphasizes, certain branches of digital design—such as web design, interface design, and game design—require knowledge

and practices derived from various fields, including communication, marketing, architecture, information technology, ergonomics, and cognitive psychology (Macdonald, 2003, 20–22). To these, we may add the necessity of familiarity with references from the history of graphic design, aesthetics, and visual arts, which are important both for understanding and delineating the socio-cultural context of design styles and for the self-education of one's own aesthetic sense and taste.

**The relation between artificial intelligence and creativity**

In the last couple of years, AI has shifted from the role of basic automation to full content generation. While early tools performed repetitive tasks such as cropping, colour correction, and layout alignment, over the last five years, generative models like DALL-E 2, Midjourney v6, and Stable Diffusion XL have redefined creativity by enabling users to produce entirely new images from textual input.

According to McCormack et al. (2019), AI now supports the creative pipeline at every stage: ideation, execution, optimization, and personalization. These integrations bring about new perspectives on the traditional idea of design skills and reveal new challenges such prompt literacy for conceptual innovation. As AI itself plays more and more frequently the role of co-author rather than a technical tool, its integration into education must be approached with care and attention.

Creativity has also been perceived as a uniquely human characteristic that originates in the subject's intuitions, emotions, and cultural background (Burnett, 1968). However, recent AI contents have proved that they can easily be regarded as being original and even innovative. Boden (2003) states that the creativity shown by AI is in fact derivative, which means that it comes from mere statistical correlations in massive datasets andit does not have intentionality, aesthetic sensibility, or cultural empathy, which are commonly viewed as distinctive traits of visual communication products.

We consider creativity, aesthetic sense, and aesthetic sensibility to be essential aspects of human-centred design; achieving expressive and authentic design requires prior aesthetic education. Moreover, aesthetic education is important not only for avoiding standardization, stylistic confusion, the creation of compositionally incorrect content, or content with inappropriate messaging, but also for preventing potential violations of professional ethics and copyright regulations.

It is difficult to formulate an exhaustive definition of creativity—a multidimensional concept with a broad semantic spectrum, ranging from "*mystical, psychoanalytic, pragmatic, psychometric, cognitive, and socio-personality*"

approaches (Sternberg & Lubart, 1999, 4), to artistic, philosophical, technological, and economic perspectives. In the context of the digital society, creativity tends to be regarded as an essential competence, being included in most international educational and curriculum policies (Creely & Henriksen, 2019, 2). From a procedural perspective, as a specific intentional act, creativity has a complex nature—both cognitive-conceptual, sensory, and affective.

According to Berys Gaut, "creativity is the kind of making that produces something which is original and which has considerable value" (Gaut, 2003, 270), applying equally to people, acts, objects, and artifacts. Creativity thus involves not only talent and technique, but especially imagination (Stokes, 2016, 248), as the source of originality and innovation. If we refer specifically to aesthetic creativity, it is grounded in aesthetic sense, aesthetic sensibility, and the interplay of imagination, cognition, emotion, and sensation.

From the perspective of the human factor or individual, creativity represents one's personal aesthetic language—the capacity to expressively transfigure content, depending on the particularities of one's aesthetic sensibility, thought process, and socio-cultural context. In terms of object or outcome, creation has as its specific attributes originality, authenticity, expressiveness (drawing attention through aesthetic qualities and eliciting an aesthetic reaction), and uniqueness. In the case of artistic creation, uniqueness lies in its inimitable and unrepeatable character, being a signifier with definite aesthetic value. We can tell a visual creation has high aesthetic value when it has a great power of suggestion, a distinguished symbolic or metaphoric dimension which separates it from common products, which, although graphically correct, are aesthetically flat.

Our professional experience of teaching design related courses has taught us that students regard artificial intelligence as a powerful creative assistant, but that its untrained usage brings about a series of issues regarding authorship and originality. This is the reason why we believe we need institutionalised models that take into account technical competences along with ethical decision making and critical approach.

## Artificial intelligence in digital design education: theoretical foundations and pedagogical strategies

Latest research has highlighted the potential benefits of responsible and effective use of AI technologies in educational environments, with personalized learning, enhanced critical thinking, and timely feedback, as one of the most important advantages (Harry, A., 2023; Ayeni et. al., 2024). In addition to these considerations, according to Šumak et.al. (2024), it should

also be mentioned that the integration of AI-based educational tools, does "not only holds advantages for students, educators, and institutions, but also has the potential to facilitate or enhance inclusive education notably" (Šumak et. al., 2024).

Recent research on the topic of using AI technologies in education increase the importance of understanding the particularities of individual- and human-centred creativity (Salles et. al., 2020), which is viewed in various ways, from a cognitive process of ideation, to problem solving through, or as an act of innovation. It is clear that this has strong implications on conceiving different pedagogical strategies in the field of visual communication that can integrate and promote a responsible and efficient use of AI based applications. On this topic, Tang, Mao, Naumann, and Xing emphasizes that the impact of digital technology on students' creativity depends significantly on the teaching strategies and learning behaviours (Tang et al., 2022). In an effort to integrate artificial intelligence into design education, we can easily observe that while it aligns to some of the established learning theories, it sometimes falls in opposition to others. For instance, constructivism (Piaget, 1954; Vygotsky, 1978) promotes knowledge through active engagement. If we regard AI tools as being based on generative prompts or real-time feedback, we can state that they so promote exploratory learning, as long as educators make sure of the fact that students are continuously active agents.

As far as experiential learning is concerned (Kolb, 1984), there is an emphasis on individual, hands-on experience, observation, conceptualization, and active experimentation. Using AI can enable experience through rapid prototyping and personal, active experimentation through iterative refinement. Complementarily, the other two stages of observation and conceptualization could be reinforced by teachers, by means of additional tasks such as a reflective essay on the design products or a critical analysis of the process.

Another important learning theory is Sweller's cognitive load theory (Sweller, 1988) that raises the issue of overwhelming students with too much information. If we regard invisible AI integration as a solution that reduces extraneous cognitive load by automating repetitive tasks, then we can see how this principle is respected. However, we should keep in mind the fact that over-relying on this feature can negatively influence the development of the cognitive processes that take place.

Bloom's taxonomy (revised, Anderson & Krathwohl, 2001) encourages progression from lower-order (remember, understand) to higher-order skills (analyse, evaluate, create). AI tools effectively support remembering and applying design principles (e.g., colour, harmony

suggestions), but curricula should emphasize analysis of AI-generated outputs and creative synthesis that demonstrates the internalisation of key theoretical concepts that leads to original problem-solving.

Another important aspect of pedagogy (Freire, 1970) refers to providing students with the power and freedom to question authority structures. Critical inquiry could easily be stimulated among students who use AI systems, given their embedded biases. The outputs could be used as pretexts to deconstruct how algorithms favour certain aesthetics or cultural stereotypes and create the base for more representative design patterns.

As we can see, higher education could integrate AI in teaching visual communication, but this process is still uneven. Some institutions have embraced AI labs, even integrated prompt writing into curricula (Toledo-Lara, 2024), and redefined evaluation processes. Others are more cautious, and remain highly concerned about plagiarism, and originality. (Williams, 2025). Academic activities in visual communication subjects make use of both invisible and generative AI applications. Invisible AI refers to algorithmic tools that enhance usability and workflow without overtly contributing to content generation. Examples include Photoshop's Content-Aware Fill, Canva's design suggestions, and InDesign's smart layout grids.

In addition, Adobe Creative Cloud applications feature a robust AI-powered tools under the Adobe Sensei and Firefly umbrellas: Photoshop's *Generative Fill*, *Neural Filters*, and *Sky Replacement*; Illustrator's *Recolor Artwork* and *Puppet Warp*; InDesign's layout suggestions and *Content-Aware Fit*; Premiere Pro's *Auto Reframe*, *Speech to Text*, and *Scene Edit Detection*; After Effects' *Roto Brush 2* and *Content-Aware Fill* for video; and Audition's *Remix* and *Auto-Ducking*. These are features focused on profoundly technical operations - automatic masking and re-colouring, corrections and even basic generative content creation- allowing students to give more time to more conceptual actions.

We previously stated that from a pedagogical perspective, invisible AI can improve efficiency and reduce cognitive load, allowing students to focus on higher-order design tasks. However, this is achieved only if we deal with active learning, paired with critical judgement. We believe that this could be ensured by educators if they contextualize the usage of these tools in specific stages of the design process. This way, students would understand both their capabilities and limitations.

On the other hand, we cannot ignore the fact that generative AI tools do not just assist, they create, which makes active learning hard to achieve. While generative AI can improve creativity, it also produces a certain degree of ambiguity around authorship and originality. If not trained properly,

students may unwillingly infringe upon copyrighted content embedded within AI outputs. To address these issues, educators must guide instruction around several critical questions: What is the creative and aesthetic value of the AI output? Whose perspective does it represent?

Taking these into consideration, we believe that the future of design education lies in a process of human-AI co-creation, where the human is the agent that uses AI as an instrument that amplifies his vision rather than replace it. This perspective preserves human intentionality, aesthetic sensibility, cultural context, and critical reflection.

In order to guide educators in selecting appropriate AI tools in this process, we made the following comparative overview that lists the major invisible-AI and generative-AI features enabled by industry standard platforms:

Adobe Creative Cloud - provides both invisible-AI functionalities (Content-Aware Fill, Neural Filters, Auto Reframe) and generative-AI features (Generative Fill, text-to-image Firefly). These are suitable for complex creative processes that require both editing and iterative prototyping.

Midjourney specializes in high-quality generative imagery through Discord-based prompts. Strengths include stylistic control and community-driven prompt sharing, but it lacks native invisible-AI editing features.

DALL·E (OpenAI) provides text-to-image capabilities with both inpainting and out painting features, meaning edits of elements that are found within an image, respectively image extrapolation - edits based on a given image, that go beyond it. This is well-suited for rapid ideation but requires external editors for small detail refinements.

Canva embeds invisible-AI features alongside basic generative functions. It is excellent for introductory courses, and educators should keep in mind its limits in advanced customization and design creation.

Figma has a series of AI plugins that can be deployed in interface design processes, offering layout suggestions and auto layout.

Runway emphasizes video content and is capable of text-to-video creation. It is an emerging tool for advanced courses in motion design and interactive media.

## A proposition of pedagogical strategies for integrating artificial intelligence in visual communication education

Taking into consideration the specifics of each of these tools, we could say that Midjourney and Firefly could be integrated in ideation sessions, to generate themed mood boards. For example, students in an editorial design module might prompt Midjourney to create vintage magazine spreads, then

import selections into InDesign and use *Auto Reframe* to adapt layouts for mobile- sized mock-ups. DALL-E' could be used for rapid prototyping, for example in an Advertising Design class, where students could update digital advertisements by using inpainting to replace outdated imagery, reducing iteration from hours to minutes.

When it comes to detail refinements, students can make use of Photoshop's Neural Filters. In a class that teaches notions of visual hierarchy, students could auto-align layout and then adjust focal points manually, reinforcing manual design principles. Figma's AI-driven plugins are valuable tools in any user interface design project and are priceless tools for prototyping web and mobile layouts. And last, but not least, Runway could be integrated in any class related to motion design, saving students editing time and freeing them to refine narrative pacing.

With these examples in mind, we believe that AI literacy must be embedded across the visual communication curriculum, with a focus on: technical literacy, ethical approach, comparative analysis, and critical thinking. By anchoring AI integration in these concepts, educators can provide a balanced learning experience that integrates technology without affecting pedagogical quality. However, as the same technologies that enhance productivity may negatively impact originality and authenticity, educators must strike a balance—leveraging AI's strengths while cultivating originality, empathy, and critical insight.

With regard to these aspects, John Dewey's distinction between traditional learning environments—based on passive reception—and progressive education—focused on awakening curiosity, experiential approaches, and the stimulation of personal development—seems fully applicable to the current context (Dewey, 1986, 242–243). Disciplines with a pronounced aesthetic dimension, such as those in the field of visual communication, are well suited to progressive learning environments, as they can be taught within a pedagogical framework that emphasizes students' personal experiences, reflection, and self-expression. According to Dewey, aesthetic experience is a particular human attribute, which resides both in emotion and reflection (Dewey, 2005, 39), the stages of its development including aesthetic sense, curiosity, and comprehension. From this perspective, the exercise of aesthetic experience in the educational environment becomes a great opportunity to increase both student's creativity and self-expression, as well as their critical thinking skill (Petrovici & Condrache, 2023, 53). On the other hand, the active involvement of teachers in ensuring an educational environment that stimulate the creative capacities

and the aesthetic experience of students (English & Doddington, 2019, 411), is all the more relevant for visual communication design.

In agreement to the recent theories that support the expanding "of the understanding of the relation between aesthetics and education"(Todd et al., 2021, 245), and to the extent that the pedagogical act supports the role of aesthetic experience in student's research and exploration activities, as well as in the communication and understanding, the pedagogical act becomes a concrete manifestation of the progressive education paradigm. Furthermore, by fostering aesthetic experience, can be generated "multiple levels of interaction and interpretation of meaning" (Mooney, 2020, 94). Recent research in neuroscience confirms, through empirical evidence, the existence of a close connection between emotions and the acquisition of new knowledge, which further supports the need for aesthetic experiences in education that can stimulate wonder and curiosity (Costantino, 2010, 67).

In the creation of visual content, students should be encouraged to exercise their imaginative capacities and to engage in aesthetic experimentation in order to avoid uniformity and standardization of outcomes. Imagination is a dynamic function of the human mind, in which intellectual elements intertwine with emotional, affective, and volitional components. The use of AI in visual communication education is similar in structural and processual aspects to serial production, as an effect of reproductive imagination, generating contents that are largely similar to the object reconfigured through memory. On the other hand, spontaneity, aesthetic improvisation as well as experimentation in visual communication education, most particularly in digital design field, increase productive imagination, creative contents having a high degree of novelty and aesthetic expressiveness.

Even so, tools based on artificial intelligence should not be framed as a threat to creativity but as a catalyst for rethinking it. By encouraging students to explore their own creativity and teaching them to interrogate, to adapt, and to critique AI tools, we can better prepare them for a future where human ingenuity and machine intelligence coexist.

## A proposition of an assessment tool for visual communication projects using AI

Given the problematic context presented above, it becomes necessary to develop efficient metrics for evaluating visual communication projects. Thus, we consider appropriate the methodological context of the researches who, in order to equally highlight the innovative features of AI and human creativity, suggest a combination (Davis et. al, 2021) between different

instruments of quantitative analytics along with qualitative assessments for specific stages of the creation process.

In this regard, we created a proposition for an evaluation grid that could be operationalized by teachers in this academic field. Our aim was to take into consideration the aesthetic, technological and communication components of students' projects. Using a scale from 1 (poor) to 5 (excellent), this grid offers a tool to measure the quality of both concept and production of visual communication projects.

Table 1: Evaluation grid for visual communication projects created with the help of AI – authors' concept

| ***Criteria*** | ***Descriptor*** | ***1 – Weak*** | ***2 – Moderate*** | ***3 – Good*** | ***4 – Very Good*** | ***5 – Excellent*** |
|---|---|---|---|---|---|---|
| ***Conceptual Clarity*** | *The design project idea is clear and in compliance with the brief* | *The idea of the project is either unclear or irrelevant to the brief, or both* | *The concept is vaguely described and has limited relevance to the brief* | *The idea has a satisfactory clarity and a certain degree of alignment to the brief* | *The idea is well-developed and relevant to the brief.* | *The idea is highly original; the concept is well articulated and responds to the needs expressed in the brief* |
| ***Creativity & Originality*** | *The contribution is original, offers distinctive design solutions and does not use visual stereotypes.* | *The idea is either extensively generic, or it is copied from an already existing source.* | *The concept has minimal originality and the design solution it offers is easy to predict.* | *The project offers a few distinctive elements, although there is place for improvements.* | *The idea is very creative, with a few elements that have not been used exactly in that way in the same context.* | *The concept is surprising, original and unique.* |
| ***Aesthetic value*** | *The visual composition has aesthetic function: is harmonious and the use of typography, colour, layout, and overall design are in coherence with the* | *The visual composition is of low quality and does not respect basic aesthetic principles.* | *The visual composition is built on basic design solutions and presents several visual incoherencies.* | *The visual composition is well balanced and harmonious from an aesthetic point of view.* | *The visual composition is aesthetically appealing and very well sustained by design choices.* | *The visual composition is flawless as aspect and technical production.* |

| | | | | | | |
|---|---|---|---|---|---|---|
| | *concept and brief.* | | | | | |
| ***Communication effectiveness*** | *The visual content acts as part of a communicatio n product: it has a clear message, targets a certain audience and has persuasive and informative function.* | *The message of the visual composition is not clear or complete.* | *There is some information intended to the audience, but it is poorly presented.* | *The information intended for the audience is distinctive and its chosen design is functional.* | *The message is highly visible; its form is persuasive and tailored for the target audience.* | *The visual composition acts as a persuasive tool to convey the desired message, both at an emotional and cognitive level.* |
| ***AI Integration transparency*** | *The usage of AI is specifically described: what prompts were used; what tools or features were applied.* | *There is no document or sources describing the integration of AI in the production of the visual product.* | *There is a limited account of AI integration.* | *The documentation is basic and lacks relevant details.* | *The student's account is clearly documented; the educator understands the general design process.* | *The student's documentatio n is detailed, well-structured and transparent, with a subjective take on AI's role in the design process.* |
| ***AI Integration critical use*** | *The usage of AI is critically approached, from both a strategical and ethical standpoint.* | *AI was overly-used with no critical judgement involved.* | *AI was used with a superficial critical approach on the output.* | *AI has been functionally engaged in the design process, but the critical approach was basic* | *AI was used strategically in the design process, with a critical take on the output.* | *AI was thoughtfully used, with respect to the strategic and ethical implications of the output.* |
| ***Ethical & Legal awareness*** | *There is a special attention given to copyright and cultural representation* | *The student ignored any ethical implications of the visual product.* | *The project proves weak ethical considerations* | *The student was aware of the most common principles regarding authorship and cultural biases.* | *The student shows a responsible and cautious approach of the ethical issues of the* | *The student proves a high level of ethical principles.* |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | *visual message.* | |
| ***Visual communication principles & references*** | *There is a good level of knowledge and abilities regarding design theory and visual references.* | *There is no visual theory reflected in the execution and no mention of references.* | *The implementation is weak or flawed.* | *The student shows an medium level of theoretical implementation.* | *The student proves a good understanding of design principles and visual references are present.* | *The theoretical grounding is refined and the list of visual references is complete.* |
| ***Technical competences*** | *Technical criteria are considered: file organisation, image resolution and layout settings, software handling.* | *There are major technical errors in the visual project handed by the student.* | *The file is functional from a technical point of view, but has some weakness and inadequacy* | *The technical decisions were correct and in accordance to the brief.* | *The student has done a series of technical revisions to the project.* | *The student meets professional standards regarding the technical execution.* |
| ***Design stages & iteration*** | *There is documented evidence of the design process, from concept development to prototyping and feedback implementation.* | *There is no documentation of the design process.* | *There is small evidence of the process that was followed, but does not respect the standard design stages.* | *The student presents in a summary way the major steps and iterations.* | *The process is iterative and described in clear, well-defined stages.* | *The student presents the design process in a detailed manner, with a reflective and critical approach.* |
| ***Total Score: 50**** | | | | | | |
| **If needed, educators can multiply this score by 2, in order to reach a 100 points scale.* | | | | | | |

## Discussion, limitations, and future considerations

The use of AI-generated content in digital design practice in the field of academic education raises a series of ethical issues. Firstly, the notion of originality and authorship become problematic. Students may believe that generating an image from a prompt constitutes original work, but in reality,

such outputs are mere interpolations of already existing data. For this reason, we consider that institutions should develop clear policies requiring students to document their creative process, including prompt logs and tool disclosures. Specific guides should evaluate the conceptual input and critical engagement, not just aesthetic quality.

Secondly, generative AI models often perpetuate biases present in their training data. This can result in stereotypical or exclusionary imagery, particularly in representations of gender, race, and ability. Teaching critical media literacy is therefore essential. Students should learn to audit AI outputs, identify problematic patterns, and revise accordingly. Diverse datasets and inclusive prompt strategies can help mitigate bias.

Thirdly, students should be introduced to the impacts of AI and encouraged to adopt critical design practices. Equally important is avoiding dependency. While AI can accelerate production, it should not replace foundational skills in composition, typography, or storytelling. Creativity, imagination, and tool-independent thinking remains vital.

Design education is at a turning point shaped by the emergence of invisible and generative artificial intelligence. As the creative process becomes increasingly co-authored by machines, educators must reimagine curricula that integrate technological fluency, ethical reflection, and human-centred creativity. By embedding AI literacy, refining assessment strategies, and promoting critical engagement, educators can help students develop the skills and mindset needed to thrive in evolving creative industries. The path forward lies not in resisting AI, but in cultivating wise, intentional, and responsible use that empowers future designers to lead with originality and integrity of AI demands a new kind of visual communication education - one that is technologically savvy, ethically grounded, and critically engaged. By distinguishing between invisible and generative AI, conducting comparative tool analyses, and anticipating future trends, educators can prepare students to navigate the complexities of modern visual communication. To our mind, the goal is not to resist AI, but to harness it with competence, intention, and professional knowledge.

While this article proposes a theoretical and pedagogical framework for integrating AI into visual communication education, several limitations must be acknowledged to contextualize its claims and encourage further research, as it follows.

1. Lack of empirical data and a need for applied research

We are aware of the fact that a significant limitation of the current study is the absence of empirical classroom data. The arguments presented are

primarily based on theoretical frameworks, philosophical perspectives (e.g., Boden, 2003; Gaut, 2003), and conceptual analyses of AI's potential impact on creativity and pedagogy. While these perspectives provide a valuable foundation, future research should include pilot studies, case studies, and quantitative metrics to measure actual student outcomes. Surveys of student experiences, analysis of AI-assisted design projects, and studies on creative development would strengthen the evidence base and validate the proposed recommendations.

In particular, testing the evaluation grid proposed in this article in real classroom settings would be essential to assess its reliability and applicability. Iterative refinement of the grid, informed by feedback from both students and educators, would enhance its credibility as an assessment tool.

Furthermore, a mixed-methods research approach would significantly strengthen the pedagogical recommendations proposed in this article. Qualitative interviews with educators, focus groups with students, and content analysis of AI-assisted projects could complement theoretical insights and provide a richer understanding of AI's impact in diverse educational contexts.

2. Balancing theoretical and practical perspectives

Another limitation is the current over-reliance on theoretical and philosophical arguments when discussing AI's impact on creativity. While scholars like Boden (2003) and Gaut (2003) offer essential insights into the nature of creativity, their views are primarily rooted in cognitive science and philosophical aesthetics. Some industry perspectives—particularly from design professionals actively integrating AI into their creative workflows—would help us create a clearer perspective on the benefits of AI integration in creative processes.

These professional views could counterbalance the perception of AI as a threat and indicate how it can be deployed as an amplifier of creative potential, especially in iterative prototyping and speculative design.

Moreover, some researchers (Khan, Shokrizadeh & Cheng, 2025; Gmeiner et al, 2025) argue that AI enhances creativity by reducing cognitive load, allowing learners to focus on conceptual innovation rather than technical execution. AI-supported environments can promote engagement, determining students' transition from creators to curators and critics of design alternatives. Iterative prototyping with AI tools fosters divergent thinking and risk-taking, especially during early-stage ideation processes.

3. Dataset bias and cultural representation

AI-generated media raises concerns about bias and stylistic homogenization. Generative models are typically trained on datasets dominated by Western-centric visual cultures, reinforcing a Eurocentric aesthetics and sometimes marginalizing underrepresented visual narratives. This can result in standardization of output, where certain styles, themes, or representations are over-reproduced, while diverse or local narratives remain absent.

Future research and pedagogical strategies should include non-Western viewpoints, incorporating perspectives from educators and artists who use AI to explore alternative aesthetics. This broader cultural engagement would help mitigate bias, support inclusion, and encourage students to question whose perspectives are embedded in AI outputs.

## Conclusions

All in all, integrating AI into visual communication education presents a complex paradox: the same tools that enhance efficiency may erode originality if used uncritically. To avoid this pitfall, educators must foster a reflexive, inclusive, and ethically grounded pedagogy, one that acknowledges AI's transformative potential while cultivating human creativity, cultural diversity, and aesthetic discernment. By expanding research methodologies, incorporating non-Western perspectives, and validating assessment tools in practice, the field can move toward a more comprehensive understanding of how AI reshapes creative education. The goal is not to resist AI, but to harness it wisely, ensuring that the next generation of designers can lead with innovation, integrity, and critical insight.

Besides these considerations**,** a few research questions remain open for further study: How does multi-modal AI integration influence student engagement and narrative competence, and what are the long-term effects of transferring creative steps like sketching and ideation to AI?; In what ways can AI-generated peer feedback complement human reviews and how do combined quantitative-qualitative metrics correlate with perceived creativity gains?; and last, but not least, which pedagogical interventions most effectively reduce the negative effects of AI-driven assignments?

Regarding future trends and research agenda, we appreciate that as AI technologies evolve, several emerging trends and open research questions deserve attention, especially multi-modal and generative advances and artificial intelligence as collaborative peer and tutor. Recent innovations in AI-driven media include text-to-video models such as *Phenaki*, developed by researchers at Google, which can generate variable-length videos from open-domain textual descriptions. In the realm of 3D content generation,

DreamFusion utilizes pretrained 2D text-to-image diffusion models to perform text-to-3D synthesis without requiring 3D training data. These multimodal models enable new pedagogical approaches in motion design and visual storytelling, offering students hands-on experience with narrative sequencing and volumetric visualization. Emerging frameworks conceptualize AI agents as collaborative peers or tutors within design teams, facilitating human-AI interactive learning environments. Investigating the dynamics of human-AI teamwork can reveal best practices for role definition and feedback loops in studio environments.

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