

A COMPARATIVE STUDY ON AI VERSUS HUMAN DESIGN IN COMMUNICATION DESIGN EDUCATION

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This study complies with research and publication ethics.

Abstract

This study aims to compare the creative outputs of AI and human designers by analyzing design products created based on a specific text. It also examines how an individual's competencies influence the originality of AI-generated work. The research employs quantitative content analysis, assessing the success of designs using criteria such as relevance to the text, creativity, originality, storytelling, and the application of artistic elements and techniques. The findings reveal that while AI excels in applying artistic techniques, its creativity and originality are still shaped by the designer. Additionally, the study shows that technical knowledge enhances creativity; participants with a strong command of technology produced more daring and inventive works. However, both AI and human designers struggled to effectively convey story and emotion in their designs.

Keywords: artificial intelligence, ai art, communication and design education, creativity, visual communication.

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İLETİŞİM TASARIMI EĞİTİMİNDE YAPAY ZEKÂ VE İNSAN TASARIMI ÜZERİNE KARŞILAŞTIRMALI BİR ÇALIŞMA

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Bu çalışma araştırma ve yayın etiğine uygun olarak gerçekleştirilmiştir.

Öz

Bu çalışma, belirli bir metin temel alınarak oluşturulan tasarım ürünlerini analiz ederek, yapay zekâ ve insan tasarımcıların yaratıcı çıktıları karşılaştırmayı amaçlamaktadır. Aynı zamanda, bireyin yeterliliklerinin yapay zekâ tarafından üretilen çalışmanın özgünlüğünü nasıl etkilediğini incelemektedir. Araştırmada, tasarımların başarısı, metne uygunluk, yaratıcılık, özgünlük, hikâye anlatımı ve sanatsal öğelerin ve tekniklerin uygulanması gibi ölçütler kullanılarak nicel içerik analizi yöntemiyle değerlendirilmektedir. Bulgular, yapay zekanın sanatsal tekniklerin uygulanmasında üstün olduğunu, ancak yaratıcılığının ve özgünlüğünün hâlâ tasarımcı tarafından şekillendirildiğini ortaya koymaktadır. Ayrıca, çalışma, teknik bilginin yaratıcılığı artırdığını; teknolojiye hâkim olan katılımcıların daha cesur ve yaratıcı işler ürettiklerini göstermektedir. Bununla birlikte hem yapay zekâ hem de insan tasarımcıların, tasarımlarında hikaye ve duyguyu etkili bir şekilde aktarma konusunda zorluklar yaşadıkları da gözlemlenmiştir.

Anahtar Kelimeler: yapay zekâ, yapay zekâ sanatı, iletişim ve tasarım eğitimi, yaratıcılık, görsel iletişim.

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Introduction

"It is a truth universally acknowledged that art always has a long-standing, complex, and continually evolving relationship with science and technology" (Chen et al., 2020, p. 47). On the one hand, this demands that artists and designers continuously adapt by evolving their practices, perspectives, and approaches to production; on the other hand, it presents art and design students with new challenges and obstacles. This situation – coupled with discussions about the potential destruction of many sectors by artificial intelligence and its rapid, unexpected advancement - leads art and design students, like many others, to experience constant anxiety about their future. This situation is associated with the concept of 'AI anxiety' frequently mentioned in the literature, and it is supported by the literature as well:

The McKinsey Global Institute estimates that 400 to 800 million workers will be replaced by AI by 2030. (...) It is precisely because of the large number of such professional opinions and facts that AI anxiety has become a universal phenomenon that will greatly impact individuals' future study, work and life paths (Huang & Li, 2020).

With the rise of generative artificial intelligence, which has significantly impacted the fields of design and art, AI anxiety is increasingly being observed not only among those in unskilled jobs but also among individuals engaged in or studying fields requiring high levels of intellectual expertise. Thus, "Among the diverse branches of AI, generative AI has recently garnered attention for its ability to swiftly generate new content, be it text or images" (Kim et al, 2023, p. 3). Therefore, this type of artificial intelligence has brought different branches of art into interaction with technology much more than before and introduced the concept of "artificial intelligence art" into literature.

Can artificial intelligence truly replace individual creativity in deeply human activities like art and design? The literature presents diverse discussions on this topic. "Although AI-created art is frequently complex to tell apart from human-created art, opinions on its worth and authenticity vary" (Then, et. al., 2023, p. 2). There is also literature that is skeptical about the applications of artificial intelligence in art and criticizes and discusses works produced with artificial intelligence in terms of originality, value, creativity, and ethical issues. In the context of these discussions, "concerns over originality, authenticity, and the possibility of individual artistic styles being replicated or diluted by AI are brought to the fore" (Mikanolyte & Kneer, 2021, p.2). Additionally, those who argue that artificial intelligence cannot produce art cite several reasons, including the belief that "machines do not possess human-like intelligence, autonomy, mental states, emotions, or - partly as a result of these - the agency required to participate in social relations" (Mikanolyte & Kneer, 2021, p. 1). According to a third perspective;

AI demonstrates algorithmic ingenuity, endless iterations, and predictive creativity, but lacks the depth of emotional understanding, intuitive insight, and nuanced interpretation that characterize human artistry. The dialogue between AI and hu-

man creativity suggests a future where collaboration, rather than replacement, defines the artistic landscape (Interaction Design Foundation, 2024).

As seen, the literature is divided on the role of artificial intelligence in art production. In this context, this study analyzes designs created with AI and those produced by students using their own technical skills in terms of creativity, application of basic design principles, and technical contexts. It also explores the validity of these concerns, the comparative strengths of AI-generated versus student-created designs, the significance of the designer's AI literacy level in AI-based design and offers recommendations on adapting current education to digital transformation.

AI, Creativity, and Design Pedagogy: A Historical Perspective

"John McCarthy first introduced the term 'artificial intelligence' in 1956 during the inaugural academic conference on the topic" (Smith et. al., p. 4). After the concept was introduced to the literature by McCarthy, many studies in different disciplines have made different definitions of what artificial intelligence could be. In this sense, it does not seem possible to make a single definition of artificial intelligence. For example, according to Baum (2023); "Artificial intelligence (AI), also called machine intelligence, is intelligence demonstrated by machines, as opposed to natural intelligence, such as intelligence such as "learning" and skills such as 'problem solving' exhibited by humans and other animals". On the other hand, Russell and Norvig (2020) define artificial intelligence as "AI stands for the imitation by computers of the intelligence inherent in humans" (Russel & Norwig, 2020, p. 15), and in this context, they state that the artificial intelligence used today is not truly artificial intelligence. Another definition is that "it is a technology that enables machines to imitate various complex human skills" (Russel & Norwig, 2020, p. 15) and it is a "computational paradigm that codifies intelligence into machines" (Xing & Marwala, 2006, p.1). Based on these and similar definitions, artificial intelligence represents a vision that aims to conceptually transfer the capacities, skills, and competencies of organic intelligence to digital technologies.

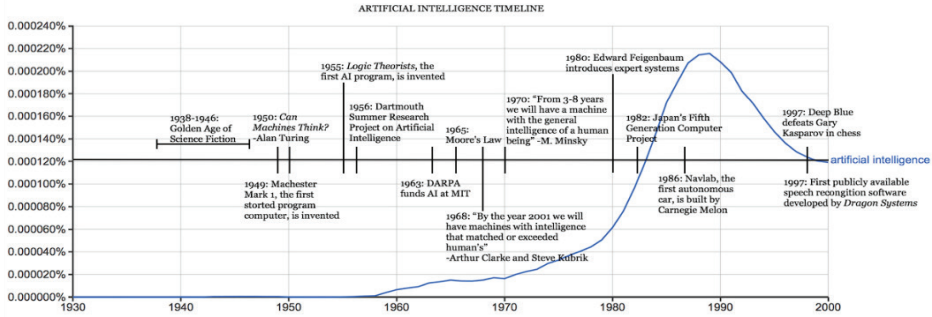
This vision traces back to ancient times, well before digital technologies became prevalent tools of production. Such that, "ever since Homer wrote of mechanical 'tripods' waiting on the gods at dinner, imagined mechanical assistants have been a part of our culture" (Buchanan, 2005, p. 53). If we look at more recent history (Buchanan, 2005, p. 55);

AI in its formative years was influenced by ideas from many disciplines. These came from people working in engineering (such as Norbert Wiener's work on cybernetics, which includes feedback and control), biology (for example, W. Ross Ashby and Warren McCulloch and Walter Pitts's work on neural networks in simple organisms), experimental psychology (see Newell and Simon [1972]), communication theory (for example, Claude Shannon's theoretical work), game theory (notably by John Von Neumann and Oskar Morgenstern), mathematics and statistics (for example,

Irving J. Good), logic and philosophy (for example, Alan Turing, Alonzo Church, and Carl Hempel), and linguistics (such as Noam Chomsky's work on grammar). These lines of work made their mark and continue to be felt, and our collective debt to them is considerable. But having assimilated much, AI has grown beyond them and has, in turn, occasionally influenced them.

In this context, the evolution of artificial intelligence until the 2000s is presented as a summary in the table below.

Image 1. History of AI (Anyoha, 2017)



The related chart ends in 2000; however, since the 2000s, artificial intelligence research has entered a transformative phase. With the rapid rise of generative AI and its widespread accessibility to both everyday users and professionals -especially after the COVID-19 pandemic- AI has, for the first time, begun to pose a significant threat to fields like design and art, which were previously believed to be exclusively driven by human creativity beyond routine tasks or mathematical functions.

Defining AI Art: Between Automation and Artistic Agency

"Computers are not new to art historical research. Since the 1960s, computer technology has been integrated into collections management, initially playing an indirect role and, within a decade, directly influencing art historical methodologies" (Drimmer & Nygren, 2023, p. 3). In this context, the past five years have been particularly eventful at the intersection of digital technologies, visual arts, and design. The emergence of "artificial intelligence art" has recently joined the ongoing discussions surrounding NFTs, the algorithms driving their creation, Metaverse technologies, and the innovations introduced by rapidly advancing generative AI.

"The fusion of AI and art has led to the emergence of a new genre known as AI Art, characterized by distinct artistic standards and features that require us to study and redefine them" (Chen, et al. 2020, p. 47). In this context, defining artificial intelligence art is essential. However, as with many concepts in

the social sciences, there is no single definition. The interpretation of AI art can vary depending on the artistic discipline involved and the cultural context in which it is applied. Below are some examples of artificial intelligence art. According to Adobe (2024), one of the biggest players in the design and art sector “AI art is, simply, artwork made with the assistance of generative AI –a technology that finds patterns in big datasets and uses that information to create new content” (Adobe, 2024). “Though commonly associated with visual art –images and video, for example– the term AI art also applies to audio compositions, including music” (Kerner, 2024). “AI-generated art has introduced a collaborative process between humans and machines, where the artist defines the parameters, and the AI fills in the details, which results in artworks that might not have been possible otherwise” (Interaction Design Foundation, 2024).

Generative AI is merely in its infancy. However, “In the first half of 2023 alone, \$15.2 billion was invested in generative AI companies, leading to the birth of a number of startups aimed at developing AI-based products” (Kim et al., 2023, p. 3). This rapid influx of capital and innovation indicates the growing confidence in generative AI’s potential to revolutionize various industries, from content creation and design to personalized marketing and beyond. As technology continues to evolve, its applications are likely to expand, bringing both new opportunities and challenges in shaping the future of creative and commercial practices.

The rapid growth in the artificial intelligence sector, whether productive artificial intelligence can replace the artist in the fields of art and design, and the rapid changes in the possibilities of the technique and the effects they have on society and the sector have brought about an increase in the number of studies discussing artificial intelligence art, whether AI art can stand alone as a genre of art, and whether AI art has aesthetic and artistic value in the field.

Liu (2023) examined the possibilities of artificial intelligence art in four dimensions: “creativity, motivation, self-awareness and emotion”. This study also followed Liu’s footsteps; however, it added the “technical” dimension to these four dimensions.

The Anatomy of Design: Evaluating Artistic and Design Principles

Creativity

“While creativity is commonly understood as the ability to produce original and novel work or knowledge, its universal definition remains highly debated, largely due to its complex and multifaceted nature” (Xing & Marvala, 2006, p. 1). The earliest definitions of creativity were based on the concept of the creative individual, when Guilford (1950, p. 444) defined creativity as “the abilities that are most characteristic of creative people” (Al-Ababneh, 2020, p.

245). However, there are various different definitions related to the concept, such as “the production of novel, appropriate ideas in any realm of human activity, from science, to the arts, to education, to business, to everyday life” (Amabile, 1997, p. 40), “a domain-specific, subjective judgment of the novelty and value of an outcome of a particular action” (Ford, 1996, p. 1125), “the production of novel and useful ideas in any domain” (Amabile et al., 1996, p. 1155), “the generation of novel ideas, without too much regard for their usefulness” (Cook, 1998a, p. 4) etc.

As indicated by these definitions, key concepts, such as originality, novelty, and usefulness, are essential in defining creativity. Each element contributes uniquely: originality emphasizes the uniqueness of the work, novelty highlights its newness or innovation, and usefulness suggests a purposeful or meaningful impact. Therefore, when evaluating the creativity of an artwork, these criteria become critical benchmarks. By assessing originality, novelty, and usefulness, one can determine not only the aesthetic appeal of the piece but also its contribution to artistic expression and its relevance within a broader cultural or conceptual framework.

Motivation

Motivation encompasses all the impulses that lead a person or artist to produce a design or work of art. In other words, motivation is the fundamental reason behind the production of a work. One type of motivation is the inspiration to create art. In the case of musical inspiration, for example, artificial intelligence can generate musical inspiration through changes in emotion after analyzing the possible effects of emotional fluctuations on musical inspiration (Liu, p.816). Motivation can arise from many reasons, “self-expression, communication, entertainment, catharsis and healing, immortality, recognition, financial gain, connection, etc.” (Zureikat, 2023; AIA, 2020).

Self-awareness and emotion

Self-awareness and emotion are considered the basic conditions of artistic production and creativity. Indeed, until today, artistic production has been considered an action specific to humans, and the most important feature that distinguishes humans from other living beings is their self-awareness. “Self-awareness is the ability to recognize and comprehend one’s own thoughts, emotions, motivations, strengths, and weaknesses. For an artist aiming to produce genuine and impactful work that expresses their distinct voice and vision, this quality is essential” (Tardging, 2023).

When we look at the other important component, emotion, we see that this, together with self-awareness, is a component that determines the uniqueness of the work of art and creates its aura. Emotion and self-aware-

ness infuse the work with depth and authenticity, offering a glimpse into the artist's inner world. This connection between creator and creation is what allows the artwork to resonate deeply with its audience, transcending mere aesthetics to evoke a meaningful emotional response.

Method

The study employed quantitative content analysis as its method. Quantitative content analysis is used to "provide an objective, measurable, and verifiable explanation of the manifest content of messages" (Fiske, 1996, p. 176). In quantitative content analysis, visual materials such as photos, designs, and artworks are treated as texts, with their descriptive and distinctive patterns analyzed quantitatively. This choice is grounded in the objectivity of quantitative methods, which remain unaffected by the researcher's personal biases. The content analysis form weighs creativity and originality, the use of artistic elements, storytelling, and the application of basic design principles. The items measuring creativity and originality were adapted from the scale of visual creativity in art developed by Akca and Kavak (2021). Also, some items derived from Liu's (2023) study, and the scale was created as shown in *Appendix 1*.

36 students from the Visual Communication Design department at a state university were tasked with creating two designs as part of their Metaverse Technologies course¹. This selection was made based on accessibility. While this may seem like a limited representation at first glance, it holds notable relevance in the context of Türkiye's higher education landscape. Visual Communication Design programs are not widely available in state universities, making this sample particularly valuable for understanding how the field is evolving within public institutions. However, for broader generalizations, further comparative studies including different institutional structures and curricula would strengthen the representational power of the findings.

The students were provided with written instructions detailing the desired content and qualities of the designs, and they were free to choose their techniques, resulting in products that included photo-manipulation, digital illustration, motion graphics, and pixel art. Subsequently, the same students were asked to convert the provided text into prompts for use with artificial intelligence, which then generated designs based on the same brief. The students had the freedom to choose the AI application for this task. The given text was:

Describe a dark and mysterious forest in the forest at midnight, with moonlight filtering through the leaves. A mysterious peak should appear among the shadows of the majestic trees. There should be mysterious symbols and dragon symbols above the door. There is someone in front of the door, is it obvious whether this person

¹ The ethics committee approval has been obtained with number 16/09 from Aydın Adnan Menderes University.

has a sword or a staff in his hand, is he a loyal friend or a creature with him? There should be an atmosphere that will leave the audience in suspense and draw them deeper into the story to increase the visual effect.

The scale used for evaluation consisted of five response options: (1) "Definitely Unsuccessful", (2) "Unsuccessful", (3) "Neutral", (4) "Successful", and (5) "Definitely Successful". Each participant's work was assessed by the researcher based on this scale. The score range was calculated as 0.80 by dividing the scale width by the number of rating categories. Accordingly, the score intervals for each response were determined as follows: "Definitely Unsuccessful" (1.00–1.80), "Unsuccessful" (1.81–2.60), "Neutral" (2.61–3.40), "Successful" (3.41–4.20), and "Definitely Successful" (4.21–5.00). Based on this distribution, the threshold for considering participants as successful was set at 3.41, which corresponds to the lower limit of the "Successful" category.

By applying content analysis to 72 images obtained because of the research, it is tried to reveal the possibilities of the current artificial intelligence, the competence of the students to use these possibilities, and whether the work they do with their own manual skills or the artificial intelligence applications are superior in terms of quality.

Findings

All participants had received at least three years of formal education in design and communication at a state university in Türkiye. To be eligible for inclusion, participants were required to be actively enrolled in the Visual Communication Design program, ensuring a baseline level of specialized knowledge and skills relevant to the research objectives. Initially, 36 students agreed to participate; however, one participant's work was ultimately excluded from analysis as it did not satisfy specific research criteria. This adjustment resulted in a final sample size of 35 participants, with 18 female and 17 male students. The group included 6 fourth-year students and 29 third-year students. Importantly, the difference in academic year between third- and fourth-year students was deemed to have no substantial effect on the research outcomes. This is attributed to the structure of the Visual Communication Design curriculum, in which foundational design principles and techniques are taught by the end of the first year. From this point onward, students primarily engage in department-specific projects and applications.

Choosing the tools of creation: Technology preferences of participants in design

The research structure was divided into two stages. In both stages, participants were provided with a text and tasked with creating a design inspired by its content, allowing for a controlled basis of comparison between traditional

and AI-assisted design approaches. Participants were given full freedom in selecting the tools and techniques they wished to use. By doing so, it was aimed at granting them flexibility in their creative process. However, the stages differed in one key aspect: in the first stage, participants were explicitly instructed “not to use any form of artificial intelligence” in their design process. This requirement aimed to capture the participants’ unique design skills and decision-making without external technological assistance. In the second stage, participants were required to incorporate AI into their designs, introducing a variable intended to analyze how AI influences creative choices and visual outcomes. This two-stage approach allowed for a comparative analysis of the differences in style, complexity, and creativity between traditional design methods and those enhanced or modified by AI.

In the first stage, designers used the following tools: *Adobe Photoshop* (24 participants), *Adobe Illustrator* (5 participants), *Blender* (3 participants), *Adobe Fresco* (1 participant), and *Pixilart* (1 participant). One participant created a traditional illustration using paper and pencil. In the second stage, where AI was mandatory, participants employed a range of AI technologies: *Leonardo AI* (11 participants), *Firefly* (7 participants), *Da Vinci AI* (5 participants), *Bing AI* (4 participants), *Copilot* (3 participants), *DALL-E* (2 participants), *NightCafe* (1 participant), and *Stable Diffusion* (1 participant). Additionally, one participant used the generative fill feature in *Adobe Photoshop*.

The examination of the participants’ work revealed that all the participants that used Photoshop employed the “photo-manipulation” technique by combining images from various sources into a single composition. Furthermore, five participants used digital illustrations, and three participants created 3D animations. The remaining applications included pixel art (1 participant), traditional illustration (1 participant), and collage (1 participant). In the AI-driven phase, all participants exclusively utilized “AI illustration” techniques without exception.

Aligning vision with narrative: Assessing content accuracy between design and given content

The primary focus during the analysis was assessing how well the participants’ designs aligned with the text they were provided. Key considerations included how effectively the elements described in the text were added into the design and the extent to which the visual narrative reflected the narrative of the text. Overall, the analysis revealed that participants struggled to create designs that accurately represented the content given to them. The average alignment score was 3.31, which is lower than the threshold of 3.40 required for the designs to be considered satisfactory.

Next, the designs created without AI and those created using AI were separately evaluated for their alignment with the content. The analysis revealed

that there was a significant difference between the two approaches. Specifically, designs produced by the participants themselves (Avg. = 3.74) were noticeably more aligned with the given content compared to those generated using artificial intelligence (Avg. = 2.82).

Beyond imitation: Evaluating originality, creativity, and motivation

When assessing the overall originality of the works, there appears to be an issue with originality (Avg.=3.1). However, a significant difference emerges when comparing works created by participants themselves to those generated by artificial intelligence. The works produced by participants (Avg.=3.60) are notably more original than those generated by AI (Avg.=2.57). It was figured that the primary factor behind this difference is the artificial intelligence technology used and the prompts provided. The works that exhibit significant similarity often stem from the same AI, or, even when different AIs are used, participants tend to input the given text directly into the AI as a prompt rather than crafting a unique prompt based on the text provided. Moreover, when examining works that are strikingly similar and lack originality, it becomes evident that these were generated using both the same artificial intelligence and the same prompt. The artworks in *Image 2* illustrate the issue of uniqueness when the same AI is used without carefully crafted prompts. Despite being created by different participants, the pieces are nearly identical.

Image 2. Examples of artificial intelligence produced by different participants who used the text given to them directly as a prompt



Similarly, when evaluating the overall creativity of the works, it was seen that there was a creativity issue just like the originality concern (Avg.=2.70). However, a significant difference in creativity emerges when comparing works produced by participants to those generated by artificial intelligence. Although the works created by participants themselves exhibit some creativity challenges (Avg.=3.15), they were noticeably more creative than those produced by AI (Avg.=2.57).

Next, the presence of a message, story, and emotional reflection in the works was examined. Works created by AI were found to be extremely inadequate in these aspects (Avg.=1.67 for message, 2.07 for emotion). In contrast, works created without AI were significantly more successful, with averages of 1.97 for having a message and 2.57 for emotion, compared to the AI-generated works.

Crafting aesthetics: The integration of artistic elements and techniques

Color

When evaluating the use of warm and cold colors in the produced works, it was seen that cold colors (52 works) are predominantly favored over warm colors (18 works). There is no significant difference in warm-cold color preference between works created by participants and those generated by artificial intelligence; both groups show a preference for cold colors. However, when designers do not explicitly specify color choices in AI-generated designs, the programs consistently default to shades of blue, navy, and turquoise. In contrast, participant-created designs often include a wider range of colors, such as black, gray, orange, purple, and green. Nevertheless, in both AI-generated and participant-created designs, matte colors (Avg.=3.96) are preferred over bright colors (Avg.=1.9). Do the color preferences align with the atmosphere designers aim to create in their works? According to the analysis, the color choices of both artificial intelligence and the designers generally reinforce the intended atmosphere quite effectively (Avg.=3.95). As can be seen in *Image 3*, both AI and human designers used cold colors and pastel tones to support the mystical atmosphere of the visuals.

Image 3. Color use samples of with (middle and right images) and without (left image) using AI



Next, the technical success of color application and the achievement of color harmony within the designs were examined. Overall, the works appear successful in terms of color application (Avg.=3.59). However, a significant difference was observed between works created by participants and those generated by artificial intelligence. In terms of technical color application, AI-generated works (Avg.=4) were noticeably more successful than those created without AI (Avg.=3.1).

Light and shades

After examining the color applications in the works, the use of light, the contribution of the use of light to the desired atmosphere, and the effect of the use of light and shadow in the works on the integrity of the design were evaluated. First, in all works, regardless of whether they were mediated by artificial intelligence or not, a significant light source was generally added to the design (Avg.=4.23). When we look at the extent to which the light and shadow preferences used support the atmosphere that the designers were expected to create in the works, it was seen that both the artificial intelligence and the light and shadow preferences of the designers generally supported the desired atmosphere (Avg.=3.97). However, when a comparison was made in terms of the use of light and shadow in the works mediated by artificial intelligence and without mediation in this regard, it was seen that the visuals mediated by artificial intelligence (Avg.=4.49) were significantly more successful

than the works produced without the use of artificial intelligence (Avg.=3.45). *Image 4* illustrates the difference between images created by AI and human designers. As seen in these images, human designers struggled particularly with the application and blending of shadows.

Image 4. Light and shadow use samples of with (left image) and without (right image) using AI



Subsequently, the technical success of light and shadow application and its role in achieving design cohesion were evaluated. Overall, the works were successful in light-shadow application (Avg.=3.69). However, a significant difference emerged when comparing works created by participants with those generated by artificial intelligence. AI-generated works (Avg.=4.66) were noticeably more successful in the technical application of light and shadow than those created without AI (Avg.=2.71).

Beyond aesthetics: Practical applications of design principles

In the ongoing analysis, the works were evaluated based on composition preferences, the effectiveness of relationships between design elements, and the application of design principles such as emphasis, contrast, unity, balance, and spatial depth. The findings revealed that, regardless of whether AI was involved, most compositions tended to be symmetrical. Out of the 70 works examined, 57 were designed symmetrically, whereas only 13 featured asymmetric designs.

The integrity and balance of the compositions were subsequently assessed. Overall, balance and integrity were effectively applied in the designs (Avg.=3.66). Comparing AI-generated works to those created without AI revealed a statistically significant difference: AI-generated designs (Avg.=4.31) were notably more successful in achieving balance and integrity than those created without AI (Avg.=3.03). Additionally, participants who did not use AI

generally fell below the threshold for creating effective balance and integrity in their designs, demonstrating lower success in this aspect.

To further clarify, the success of designers in establishing relationships between elements in their works was evaluated alongside composition principles. Overall, the designs demonstrated a good level of success in this area (Avg.=3.7). However, a comparison between AI-generated and non-AI-generated works revealed a significant difference: AI-generated designs (Avg.=4.43) were statistically more successful in this regard than those created without AI (Avg.=2.97). Additionally, participants who did not use AI generally fell below the threshold for effectively establishing relationships between design elements, resulting in lower success rates.

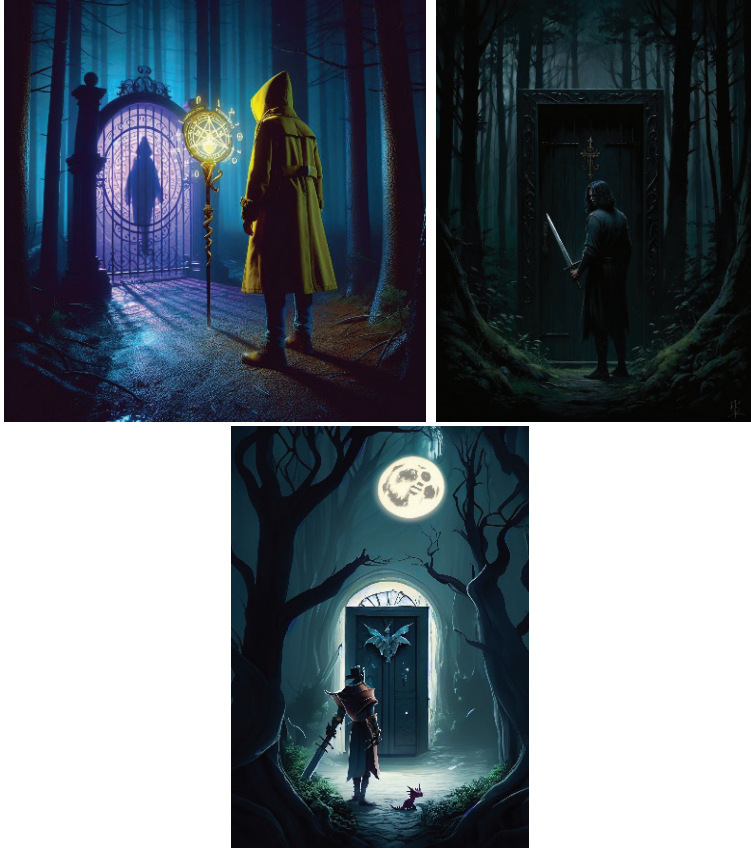
Subsequently, the effectiveness of producers in creating contrast through elements such as light, color, and size, and in highlighting and emphasizing desired features, was examined. Overall, the designs were generally successful in this aspect (Avg.=3.53). However, AI-generated works (Avg.=3.94) were statistically significantly more successful in creating contrast than those produced without AI (Avg.=3.11). Additionally, participants who did not use AI tended to fall below the threshold for effective contrast in their designs, showing lower success in this area.

In addition to evaluating contrast to reinforce emphasis, the success of participants in creating emphasis was also examined. Overall, the works demonstrated general success in this area (Avg.=3.64). However, AI-generated works (Avg.=4.18) were statistically significantly more successful in creating emphasis compared to those produced without AI (Avg.=3.14). Furthermore, participants who did not use AI generally fell below the threshold for effectively creating emphasis on their designs, showing lower success in this aspect.

Afterwards, the application of spatial depth in the designs was examined. Overall, the works demonstrated general success in this area (Avg.=3.96). However, AI-generated works (Avg.=4.37) were statistically significantly more successful in applying spatial depth than those created without AI (Avg.=3.54).

Image 5 effectively illustrates how AI design tools apply design principles. Furthermore, it was found that, as can be seen in *Image 5*, if the given prompt does not specify symmetry, AI tools tend to default to symmetrical compositions.

Image 5. Application of design principles in ai designs. balance, contrast, depth and unity



Also, the effectiveness of combining images from different sources within a single design was assessed. Overall, the designs were generally successful in this regard, with an average just above the threshold value (Avg.=3.44). However, AI-generated works (Avg.=3.89) were statistically significantly more successful at integrating diverse images compared to those created without AI (Avg.=3.0). Additionally, as can be seen in *Image 6*, participants who did not use AI generally fell below the threshold for effectively combining images, resulting in lower success in this aspect.

Image 6. Integration of variety of visuals in a composition. AI designs (right image) are clearly more successful than human designs (left image)



Finally, the designs were evaluated based on creativity, originality, technical implementation, and adherence to the provided text. Overall, the designs achieved an average just above the threshold value, indicating general success (Avg.=3.44). However, a comparison revealed that AI-generated works (Avg.=3.54) were generally more successful compared to those produced without AI (Avg.=3.34), with the latter generally falling short of success.

Bridging skill and imagination: The interplay of technique and creativity

When evaluating participants' competence in utilizing design technologies, their average score is below the threshold, indicating general inadequacy (Avg.=3.21). A comparison between their mastery of AI design technologies (Avg.=3.21) and traditional digital design technologies (Avg.=3.03) shows that participants are lacking in proficiency with both types of technologies.

Image 7 illustrates how two students with different levels of proficiency in the same design program produce distinct outcomes. Their designs differ in various aspects, including the application of design principles, creativity, and emotional expression.

Image 8. Successful (left image) and unsuccessful examples of implementation.



Another key observation is that participants' literacy in artificial intelligence, art, technology, and general knowledge significantly influences their ability to achieve creativity, originality, emotional expression, and storytelling. Examination of AI-generated works reveals a divide among participants: those who craft appropriate prompts by interpreting the given texts and those who either extract sections from the text or use it verbatim.

Works created by those who interpret and tailor their prompts (Avg.=2.65) show greater success in creativity, originality, emotional expression, and storytelling compared to works produced by the latter group (Avg.=2.16). As can be seen in *Image 1* the pieces created by participants with low literacy skills tend to lack necessary features. To support this finding, the relationship between the participants' technological competencies and their creative output was also examined. When the correlation between these two variables was examined, a positive, high-level relationship was found (.70).

Accordingly, as designers' technological literacy, technological competencies and application skills increase, they can act more courageously and produce more creative work as can be seen in *Image 7*.

Results

When examined in the context of technology and art, the transformative power of artificial intelligence over art and design is an undeniable fact. "We already know that artificial intelligence can produce art-like works that are not only indistinguishable from those produced by human agents but that these works are also perceived as having no less of an aesthetic value" (Mikalonyte & Kneer, 2021, p. 1). Mark Coeckelbergh's (2021) proposal to decompose the question "Can machines create art?" into three smaller questions – namely, what we mean by creation, art, and machines – provides a valuable framework for this discussion. To evaluate whether robots are perceived as capable of

creating art, we should consider three aspects: the agent (e.g., an autonomous robot versus a human), the process (the actions involved in bringing a work to life), and the product (the resulting object). These contexts should be repeatedly reconsidered in the context of works produced through human-machine collaboration.

Despite the transformative impact of artificial intelligence on creative industries, human creativity remains paramount when given the right opportunities and resources. While AI has significantly advanced in technical execution, it should be viewed not as a new type of designer but as an innovative tool that enhances the efficiency and effectiveness of the creative process driven by humans. To fully leverage the opportunities provided by AI and mitigate its risks, it is crucial for designers and artists to possess not only art literacy but also "artificial intelligence literacy". This dual literacy is essential for maximizing the benefits of AI while maintaining the creative force and intellectual input that humans provide.

In addition to AI literacy, the digital divide itself plays a significant role in creative work production. Participants using traditional digital methods were able to work more flexibly and produce a variety of styles, partly due to access to open-source tools like *Blender* and non-open-source tools provided by their institutions, such as *Photoshop* and *Illustrator*. Conversely, those using AI tools often relied on free versions, which led to a more uniform style in their works. This disparity underscores the need to address an "AI gap" as an extension of the digital divide, particularly considering the high costs of advanced AI technologies for designers in countries like Türkiye.

When examining works produced with traditional digital tools, technological literacy and the digital divide become crucial factors. Participants with greater technological proficiency tend to take more risks and create more original and creative works. This highlights the importance of enhancing courses in design education on technique, technology use, artificial intelligence literacy, and prompt writing. However, technical skill alone is not enough. The research found that participants struggled with creating emotions and telling stories, suggesting a significant intellectual gap. Therefore, increasing literacy in various fields and expanding the range of interdisciplinary courses in design education is essential. Some participants, despite technical inadequacies in traditional design, excelled with AI due to their strong prompt writing skills.

As a result, the research findings indicate that both individual technical deficiencies and the limitations of artificial intelligence in creativity and originality equally impact the resulting works. Thus, rather than either avoiding AI due to future concerns or treating it as a miraculous solution, a balanced approach is necessary. By integrating the intellectual capacity of individuals with the technical capabilities of AI, a more effective and enriched form of "hybrid art" can be achieved. This balanced approach allows for optimal utilization of both human creativity and AI technology. In conclusion, "those who question

the creativity of AI art are mainly skeptical about the ability of AI to 'conceive'. It has been argued that AI is better at imitating existing artistic styles or structures than creating new ones" (Li et al., 2020). This study supports this view and demonstrates that, at least for now, AI has not transcended its role as a tool to become a true creative force.

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Appendix 1. The form that used to collect data

Tools Used:

Preferred Dimensions:

If AI-Generated, Prompt Used:

Compliance with the Given Description:

Type of Artwork:

Gender:

Creativity

1. The work reflects imagination.
2. The product demonstrates original thinking.
3. An original piece was created.
4. The work is free from imitation.
5. The designer took risks and demonstrated a bold approach.
6. Various techniques and tools were combined to create an original product.
7. A diverse and rich use of images and symbols was incorporated.
8. The use of artistic elements and principles was varied and rich.
9. The application of artistic elements and principles was flexible beyond traditional approaches.
10. The work presents an interesting approach or perspective.
11. The designer enriched the work by incorporating additional elements beyond the provided ones.
12. The work reflects the main idea given.
13. The work stands out from others.

Artistic Elements

- Does the color palette consist of warm colors?
- Does the color palette consist of cool colors?
- What is the dominant color used?
- The chosen colors complement the intended atmosphere.
- Different colors are combined to create unity in the design.
- Bright colors were preferred in the design.
- Matte colors were preferred in the design.
- A distinct light source is used in the design.
- The designer applied light and shadow harmony to create unity among the elements.
- The use of lighting and shading supports the intended atmosphere.

Use of Design Principles

- The composition exhibits unity and balance among different elements.
- The designer preferred a symmetrical composition.
- The designer preferred an asymmetrical composition.

- The designer used contrasts to emphasize specific elements.
- There is a relationship between the elements used in the composition.
- Elements from different sources were combined appropriately.
- Various techniques were used to emphasize desired elements in the design.
- Different techniques were applied to create depth (spatial perspective) in the design.

Technical and Conceptual Execution

- The designer is proficient in using the chosen tool.
- The execution of the design is successful.
- The design conveys a message (the design tells a story).
- The design reflects emotion.

Participant informed consent: Participants were informed before the data collection and they were asked to sign a form of consent.

Ethics committee approval: The ethics committee approval has been obtained from Social and Human Sciences Ethics Committee of Aydın Adnan Menderes University with numbered 16/9.

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