

AI Generation Versus Manual Drawing: A Comparative Analysis Using Images Created by Professional and Non-Professional Visual Designers

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Summary

As artificial intelligence (AI)-generated image technology has developed swiftly in recent years, examining its effects on art education and creative practice has become increasingly crucial, particularly concerning applying visual elements and transmitting visual information. With this in mind, this study investigated the differences between hand-drawn sketches and AI-generated images in enhancing visual elements and in the accuracy of communicating visually. The study compared works created by both professional and nonprofessional visual designers.

Since 2022, AI tools such as DALL·E, Midjourney, and Stable Diffusion have dramatically transformed the creating of digital images. These tools have considerably enhanced the efficiency of designers and artists, providing unprecedented capabilities for high-efficiency image generation. AI tools enable the creator to produce high-quality digital images quickly and effortlessly, regardless of their level of expertise. This study quantitatively assessed whether these AI tools can enhance key visual elements in images and explored their potential to improve the accuracy of visual communication among various user groups, particularly between professionals and nonprofessionals.

This study recruited 10 creators—5 professional visual designers and 5 non-professional creators—who each created hand-drawn sketches and produced AI-generated images based on their creative themes. These works served as the basis for subsequent comparisons. In addition

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to the creators, 32 participants were invited to evaluate the images. Participants filled in a questionnaire to assess how they perceived key visual elements in each image and to analyze the textual descriptions provided by the participants to determine the alignment between the visual messages conveyed by the images and the creators' original intentions.

To ensure a fair comparison between hand-drawn sketches and AI-generated images, this study selected eight visual elements commonly used in image composition: line, shape, balance, proportion, unity, contrast, dominance-subordination, and rhythm. These elements are crucial for conveying information in visual design, aligning with the core function of sketches, and balancing the differences in creative approaches between hand-drawn sketches and AI-generated images. The participants rated each visual element on a Likert scale, which provided a quantitative assessment of their perceptions of the performance of hand-drawn sketches and AI-generated images across these eight visual elements. In addition to these perceptual data, the study applied the HanLP semantic analysis model to compare text similarities; specifically, the creators' original concepts were compared with the participants' textual feedback to evaluate how effectively both hand-drawn and AI-generated images conveyed the creators' intended messages.

The results revealed that the AI-generated images were rated higher than the hand-drawn sketches for shape, proportion, and line. The participants perceived that the AI-generated images exhibited greater precision and clarity in these elements, which can be attributed to the role of AI algorithms in optimizing visual outputs. These algorithms enable AI tools to generate detailed and accurate design elements, particularly where clarity and structure are emphasized. However, the study also revealed that the AI-generated images were less effective in conveying abstract visual elements such as rhythm and harmony, which are crucial for creating a sense of flow and dynamic balance. These abstract elements require a nuanced understanding of visual motion and the interplay between forms, which are complex concepts that AI tools may still be unable to fully grasp because of the constraints of natural language processing and training data.

In terms of overall visual communication accuracy, the study revealed that the AI-generated images did not overwhelmingly outperform hand-drawn sketches. Paired-sample *t*-tests comparing the two media did not reveal any great difference in how accurately the creators' intentions were conveyed. This suggests that although AI-generated images can enhance specific visual elements, they may not necessarily have an advantage in communicating complex or abstract concepts. Hand-drawn sketches remain effective in conveying core ideas through concrete visual elements; this underscores the continued importance of traditional drawing in art education, particularly in fostering students' abstract thinking and creativity.

The results obtained from the comparison of the hand-drawn sketches and AI-generated images revealed the considerable potential of AI-based image generation technology for future integration into art education. For instance, by using AI tools for text-driven creation, students can effectively grasp image structures and explore and apply visual elements more efficiently. AI tools allow students to conduct creative composition experiments faster while engaging in a more intuitive process for learning design principles such as shape, proportion, and line. Additionally, AI-generated images can be customized to meet individual learning needs, providing personalized educational experiences and accommodating varying levels of skill and comprehension. This flexibility is particularly valuable for fostering creative thinking and enhancing students' ability to apply visual design concepts.

AI technology also helps enhance students' visual communication abilities by enabling them to engage deeply through iterative learning processes. With rapid feedback loops, students can observe the interactions of various visual elements and understand how changes in composition affect the overall design, thereby achieving a deeper understanding of visual relationships and improving their ability to convey ideas through their works.

In summary, the ability of AI tools to rapidly generate high-quality images presents new opportunities for creative experimenting, particularly in art education, where they can serve as a valuable resource to help students improve their understanding of visual elements. The application of AI in artistic practice is a promising area for future research and development, providing opportunities to explore new modes of human-machine cocreation. By boosting productivity, AI creates new possibilities for creative activities.