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Methodological Approaches to Using Artificial Intelligence to Develop Creative Skills in Future Designers

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***Abstract*-The article analyzes methodological approaches to leveraging artificial intelligence (AI) technologies to foster the creative abilities of future designers. This study is highly relevant in the context of rapid digital transformation and the pervasive integration of innovative digital technologies across all sectors of society. It underscores the urgent need to revise and update pedagogical approaches that nurture creativity—a fundamental competence for modern designers. The purpose of this study is to develop a methodological framework for the effective integration of artificial intelligence tools into the training process of future designers, aimed at enhancing their creative potential, critical thinking, and adaptability in the context of digital transformation. The authors examine the specific potential of using generative AI models, such as Leonardo.AI and Microsoft Copilot (with DALL-E 3 integration), which enable rapid concept generation, as well as language AI models like ChatGPT and Gemini that automate text processing, information retrieval, and idea generation. A comprehensive examination of both theoretical and practical ramifications of integrating these tools into vocational education (specialty A5) is presented. The integration of these AI tools has the potential to optimize the training process, enhance creative imagination, and develop analytical skills and adaptability required by today's competitive labor market. The research methodology is based on a comprehensive model that integrates elements of competency-based, systemic, and personality-oriented approaches to creativity development. A comparative analysis of traditional teaching methods and innovative AI-based approaches is provided, emphasizing the formation of flexible and non-standard thinking in students. The study's findings highlight the necessity of continuous monitoring of the impact of AI technologies on the educational process to enable timely adjustments in methodological solutions and to manage risks associated with the automation of creative tasks. Based on an extensive review of the literature and open-source data, the study identifies both the advantages and limitations of using AI in design education. The authors note risks such as overreliance on automated content generation and potential loss of traditional design skills. To address these challenges, the article proposes a series of recommendations for the phased introduction of AI technologies through introductory classes, practical projects, brainstorming sessions, and creative competitions. These measures are designed to support the comprehensive development of students' creative potential and to maintain a balance between digital automation and hands-on, traditional design skills. In conclusion, the results demonstrate the feasibility and necessity of integrating AI into design education to develop professional, innovative, and transferable skills among future designers, equipping them to effectively compete in the evolving digital economy.**

Keywords - Artificial Intelligence, creative skills, design education, digital transformation.

I. INTRODUCTION

The accelerated digital transformation and the pervasive integration of innovative digital technologies across all sectors of society have dramatically reshaped the professional landscape for designers. In particular, the professional training of future designers now demands a comprehensive update of pedagogical approaches to equip

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students with the relevant knowledge and skills necessary for success in a highly competitive, technology-driven labour market. While traditional teaching methods have been found to be effective in cultivating foundational design skills, they have been shown to fall short in fostering the dynamic creative abilities and critical thinking required in today's digital era.

The advent of artificial intelligence (AI) has precipitated a paradigm shift within this domain. AI is defined as a specialised field of computer science focused on developing systems capable of performing tasks that typically require human intelligence, such as learning, pattern recognition, decision-making, and creative content generation [1]–[2]. Within the domain of design education, generative AI models, including Leonardo.AI and Microsoft Copilot (with integrated DALL-E 3), present novel opportunities for expeditious concept generation by automating the creation of graphic content, analysing compositional solutions, and proposing design alternatives based on user-defined parameters. Concurrently, language models such as ChatGPT and Gemini have demonstrated the capability to automate text processing, information retrieval, and the generation of ideas for presentations and explanatory materials, thereby streamlining various aspects of the creative process [3]–[4].

Notwithstanding these encouraging advancements, the incorporation of AI technologies into design education is accompanied by a number of challenges. Existing literature highlights the dual nature of AI's impact: while it has the potential to enhance creative capacities and optimise training processes, there is also a significant risk of overreliance on automated systems. Such dependence may inhibit the development of critical thinking and diminish the cultivation of traditional design skills, such as hand-drawing, composition, and manual digital modeling [3]. Furthermore, ethical and legal concerns, particularly those related to copyright issues, arise when generative models such as DALL-E and Leonardo.AI utilise vast datasets that include copyrighted material. These challenges necessitate the development of robust normative frameworks and ethical standards to guide the responsible use of AI in educational settings [1], [3].

A significant gap in current research is the lack of a clearly defined methodological framework for integrating AI into the professional training of designers. While numerous studies have confirmed the effectiveness of generative AI models in the creative process, there is insufficient guidance on how to harmoniously combine digital tools with traditional pedagogical practices to foster both creative and critical competencies. The present study aims to address this gap by developing and substantiating methodological approaches for the integration of AI technologies into design education, with the aim of enhancing students' creative potential, analytical skills, and adaptability.

The purpose of this study is to develop a methodological framework for the effective integration of AI tools into the training process of future designers. Achieving this objective involves a multifaceted approach: a critical review of existing AI applications in design education, an analysis of their pedagogical implications, and the formulation of evidence-based recommendations for their integration. The study's objective is to provide a balanced perspective that maximises the benefits of AI while mitigating its risks. This is to ensure that students not only gain exposure to advanced digital technologies but also retain and develop essential traditional design skills.

The study emphasises the importance of ongoing monitoring and adaptive management of AI's impact on education, emphasising the necessity of timely adjustments to methodological approaches. The findings of the study aim to serve as a foundation for the development of innovative educational programs that cultivate designers who are competitive, creative, and critically minded, and who are capable of thriving in the evolving digital economy.

II. MATERIALS AND METHODS

This study was conducted at the Vinnytsia State Pedagogical University named after Mykhailo Kotsiubynsky, specifically within the Department of Digital Technologies. The sample comprised 60 undergraduate students and 20 instructors involved in teaching design courses. The study was carried out over the course of one academic semester.

The investigation focused on the integration of various AI tools into the design education process. The primary AI programs employed in this study included generative models such as Leonardo.AI and Microsoft Copilot (with integrated DALL-E 3), which were used for rapid generation of visual concepts, and language models such as ChatGPT and Gemini, which facilitated the automation of text processing, idea generation, and content creation.

The data collection process encompassed a combination of qualitative and quantitative methodologies. An online questionnaire was administered to all participants before and after the intervention to assess changes in satisfaction levels, perceived creativity, and overall impact on the design process. Furthermore, practical design projects and case studies utilising the aforementioned AI tools were implemented in selected courses to evaluate their real-time impact on the creative process. The outputs from these projects, including visual concepts and text-based design proposals, were analysed to determine the effectiveness of the AI applications.

The experimental findings were contextualised within broader trends in AI integration in design education by means of a comprehensive review of open-source literature and available reports. The statistical analysis of the data was conducted in accordance with standard methodologies, encompassing the comparison of metrics before and after the intervention, including mean satisfaction scores, creative task performance, and the duration required to complete design projects.

III. RESULTS AND DISCUSSION

The integration of AI into the professional training of future designers is a relevant area of research. Modern generative and language models of AI open up new opportunities for developing creativity, automating creative processes, and improving teaching methods.Given the rapid development of technologies, special attention should be paid to analyzing their impact on the educational process, the effectiveness of their use, and the potential challenges that teachers and students may face.

To this end, the authors conducted a pedagogical experiment on the impact of AI technology integration on the educational process among 60 students of the Department of Digital Technologies and 20 teachers of Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University.

To facilitate a more detailed analysis of the changes that occurred after the introduction of AI, Table 1 shows the key indicators selected by the authors before and after the experiment. The findings reveal a substantial enhancement in the educational process, thereby substantiating the efficacy of AI in fostering students' creativity.

TABLE 1. COMPARATIVE ANALYSIS OF INDICATORS BEFORE AND AFTER AI IMPLEMENTATION

Index	Before AI implementation	After AI implementation	Changes (%)
The mean level of satisfaction (measured on a 5-point scale)	3.2 ± 0.4	4.1 ± 0.3	+28.1%
Average score for creative tasks (%)	68	82	+20.6%
Time to complete a creative task (hours)	4.5 ± 0.6	3.1 ± 0.5	-31.1%
Use of creative ideas (score/10)	5.6 ± 0.8	7.9 ± 0.6	+41.1%
Key terms using frequency (per 100 words)	2.3	3.8	+65.2%

The survey results indicated a notable increase in student satisfaction with the integration of AI methodologies. The mean score on a five-point scale increased from 3.2 ± 0.4 to 4.1 ± 0.3, suggesting a substantial rise in satisfaction levels. Concurrently, the mean score for creative tasks escalated from 68% to 82%, reflecting a significant enhancement in the quality of creative output. The following diagrams compare these indicators before and after the introduction of AI tools, demonstrating a significant improvement in the results of the educational process (see Fig. 1 and Fig. 2).

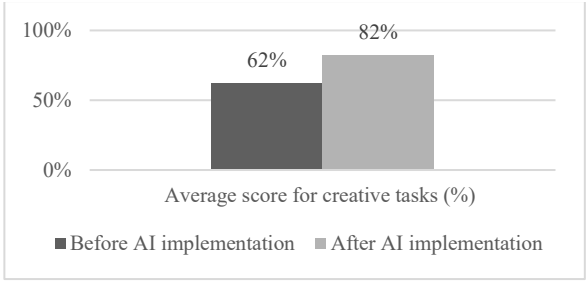

Fig. 1. Impact of AI Implementation on Creative Task Performance.

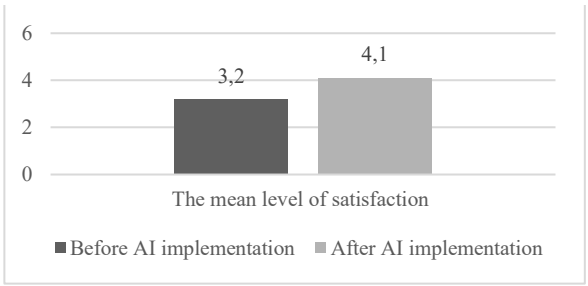

Fig. 2. Change in Satisfaction Levels After AI Implementation.

The examination of generative AI models draws on practical examples of integrating platforms such as Leonardo.AI and Microsoft Copilot with embedded DALL-E. These tools facilitate the creation of diverse, high-quality visual concepts, significantly streamlining the idea-generation process. For instance, the prompt *"Generate a modern, minimalist living room concept with Scandinavian-style furniture, large panoramic windows, soft natural lighting, and a neutral color palette. The design should include a cozy seating area with a coffee table and decorative indoor plants, following contemporary interior design trends."* yielded a comprehensive interior layout that illustrates how generative AI can assist in rapidly developing design concepts (Fig. 3).

Fig. 3. Result of generation in Leonardo.AI

Similarly, the prompt *"Create a futuristic, high-tech logo for an AI-driven startup. The logo should feature a sleek, abstract design with a combination of metallic blue and neon accents. The overall style should be minimalistic, professional, and suitable for a technology company."*

demonstrates the capacity of these platforms to generate distinctive brand elements (Fig. 4). The resulting images confirm the effectiveness of generative AI in supporting various design tasks.

Fig. 4. Result of generation in Microsoft Copilot (DALL·E)

As for the evaluation of AI language models, the results show a significant improvement in the quality of text content creation using ChatGPT and Gemini. The analysis of text generation indicators revealed that the frequency of key terms increased from 2.3 to 3.8 per 100 words on average, reflecting the increased structure and creativity of text descriptions. A graphical representation of these changes is shown in Fig. 5, which demonstrates the improvement in the quality of textual content compared to traditional methods.

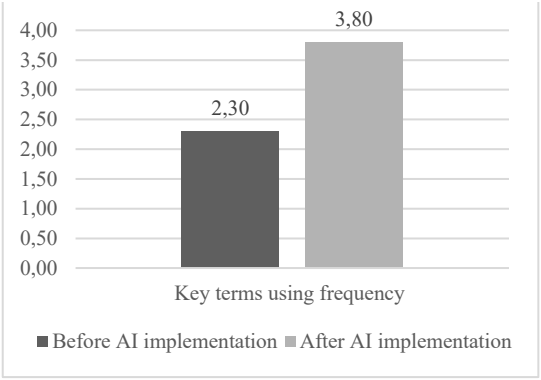

Fig. 5. Changes in key terms using frequency

The findings of the experiment substantiated the authors' hypothesis that the implementation of AI technologies exerts a favorable influence on the cultivation of creative aptitudes and professional competencies of prospective designers.Students who employed generative AI models during the execution of educational tasks exhibited a substantial enhancement in creative activity, as manifested by a 20.6% surge in creative task scores. Concurrently, a 31.1% reduction in the average time to complete tasks underscores the efficacy of automating specific design work stages, enabling students to prioritize the conceptual and analytical facets of the creative process.A comparison of the outcomes with prior studies [6-8] substantiates that they align with theoretical expectations. For instance, A. Jain and others [7] observe that generative models substantially accelerate the development of visual content, a finding that aligns with our observation of reduced task completion time. Furthermore, Crimaldi and Leonelli [8] substantiate that the integration of AI fosters experimentation with novel visual styles and amplifies the creative capacity of designers. Conversely, Kim and Lee [3] underscore the potential hazards of excessive automation, which might result in a diminution of autonomy in creative endeavors.In the present experiment, such risks did not materialize, likely attributable to the meticulous integration of AI tools into the educational milieu.

The analysis of the results indicates that generative models, such as DALL-E and Leonardo.AI, facilitate the identification of non-standard solutions and the development of visually appealing concepts, thereby obviating the necessity of extensive expertise in manual digital modeling tools. This development engenders novel opportunities for designers, who are thereby enabled to prioritize the conceptual underpinnings of a project, as opposed to the mere technical execution thereof.

Concurrently, the integration of language models such as ChatGPT and Gemini has been observed to enhance the structuring of creative ideas, facilitate the analysis of stylistic decisions, and broaden the semantic scope of projects.A comparative analysis of AI technologies and conventional teaching methods reveals both substantial advantages and limitations. The utilization of generative models has been shown to expedite the generation of visual concepts, enabling students to explore artistic styles and compositions with greater expediency.

For instance, the traditional approach necessitated several hours to develop sketches or conceptual solutions, whereas AI can accomplish this in mere minutes, enabling students to explore a broader spectrum of creative ideas. This finding aligns with studies [1]-[6], which demonstrate that automation of routine tasks enhances the efficiency of creative activity.However, it is important to note that the acceleration and simplification of the design process does have certain drawbacks. Specifically, an overreliance on AI can potentially diminish the significance of classical sketching, modeling, and manual detailing skills, which are still considered essential in the professional practice of design.Conversely, traditional teaching methods emphasize the cultivation of technical skills in conjunction with creative thinking. However, the employment of generative AI has the potential to redirect the emphasis from the technical execution of a project to its conceptual framework.

One of the advantages of AI is its capacity to personalize the learning process, a benefit that can be attributed to the implementation of adaptive algorithms. These algorithms enable language models to provide students with customized recommendations, including suggestions for enhancing their work, analyzing their

stylistic decisions, and proposing alternative approaches.In contrast, the conventional teaching method exhibits a notable lack of flexibility in this regard, as assessments and feedback are predominantly contingent on the subjective evaluation of the instructor.Notwithstanding the benefits inherent in the integration of AI into the educational milieu, it is imperative to acknowledge the potential implications, including the possibility of unifying creative products.

Given their reliance on data analysis for model training, generative models have the potential to produce solutions that bear similarities to existing samples, thereby diminishing the distinctiveness of student work. This underscores the necessity for cultivating an intentional approach to leveraging AI as an adjunct tool rather than a primary modality.A pivotal element in this paradigm is the automation of routine tasks, which enables students to allocate their attention toward more intricate phases of the creative process.

The utilization of ChatGPT and Gemini in the formulation of descriptions for design projects, the creation of structured concepts, and the analysis of stylistic solutions has the potential to streamline the development of teaching materials and presentations. This, in turn, can foster the development of professional communication skills, which are a vital component of students' future careers.

It is imperative to acknowledge the potential limitations and risks associated with the integration of AI into education, which should be given due consideration. A notable concern is the reliance on automated systems, as this can potentially diminish students' independent thinking skills [9]. The utilization of AI as the primary tool for content generation can hinder students' capacity to analyze and formulate creative solutions independently.

To mitigate this risk, it is imperative to integrate AI into the learning process as an auxiliary resource that supports, rather than replaces, students' individual skills.Another challenge pertains to the potential loss of traditional design skills, such as freehand drawing, composition, building without the use of algorithmic support, and understanding the basic principles of artistic modeling.

While AI facilitates the use of digital tools, students who depend exclusively on automated solutions may lose the capacity to generate designs from the ground up, underscoring the necessity to devise methodologies that integrate traditional methodologies with state-of-the-art digital technologies [10]. The practical ramifications of incorporating AI into the educational process demonstrate its capacity to enhance workflows, as evidenced by a reduction in the time required to complete creative tasks and an increase in student satisfaction [10]-[11].

The employment of language models has been shown to enhance the organization of creative ideas and the development of clear conceptual solutions. However, it is crucial to acknowledge the potential risks associated with reliance on automated systems, which have the potential to hinder the development of critical thinking and student autonomy [12].

It is imperative to exercise particular caution with regard to copyright concerns, as generative models such as DALL-E and Leonardo.AI generate visual concepts through the analysis of substantial data sets that may encompass copyrighted material. This practice gives rise to the potential for unwarranted utilization of protected works, thereby engendering ethical and legal dilemmas. To mitigate these challenges, there is a necessity to institute comprehensive regulations and ethical standards for the integration of AI in educational settings [6].

In light of the identified benefits and risks of incorporating artificial intelligence in the educational process of designers, it is recommended to adopt a comprehensive approach that will ensure the effective use of AI and minimize potential negative consequences. The following recommendations are proposed:

1. The integration of digital and traditional teaching methods is a subject that has been the focus of considerable scholarly attention. The development of integrated courses that combine traditional methods, such as manual sketching and composition, with the use of generative and language models of AI, is recommended. This approach is believed to ensure a balance between technical automation and the development of fundamental artistic skills.

2. The organization of introductory seminars and training sessions is imperative for the effective dissemination of knowledge in the field. Special seminars should be scheduled for educators and students to showcase the potential and constraints of artificial intelligence in design, while also addressing ethical considerations and copyright implications when utilizing automated systems.

3. The implementation of practical projects and creative competitions is a pedagogical strategy that has been demonstrated to foster creativity and critical thinking in students. The integration of practical tasks, brainstorming sessions, and creative competitions, in which students are tasked with applying artificial intelligence to solve real-world design problems, has been shown to be an effective method for achieving these educational objectives.

4. It is imperative to provide ethical and legal support to ensure the responsible integration of AI in creative processes. The development of methodologies and regulatory guidelines is crucial for guiding the ethical use of AI in such contexts, particularly with respect to copyright implications and the allocation of responsibility for the content generated. By addressing these issues, we can mitigate the risks associated with unauthorized use of protected works, fostering a secure and responsible environment for AI-driven creative endeavors.

The analysis confirms the significant potential of digital transformation in education. However, further improvement of methodological approaches requires additional research, taking into account the data obtained

from open sources. These results indicate the need for a balanced approach that allows for the use of AI technologies to optimize the creative process without depriving students of the opportunity to develop traditional design skills and critical thinking.

IV. Conclusions

The study demonstrated that integrating AI technologies into the professional training of designers can significantly enhance both the efficiency and quality of creative outputs. Specifically, the utilisation of generative models, such as DALL-E, Leonardo.AI, and Microsoft Copilot, led to an enhancement in student satisfaction (from 3.2 ± 0.4 to 4.1 ± 0.3 on a 5-point scale) and an improvement in creative task scores (from 68% to 82%), while concomitantly reducing the average time required to complete design tasks by 31.1%. In a similar vein, language models such as ChatGPT and Gemini have been shown to facilitate more structured conceptualisation, as evidenced by an increase in the frequency of key term usage from 2.3 to 3.8 per 100 words.

Notwithstanding these evident advantages, the study also identified specific challenges associated with the implementation of AI in design education. A salient concern pertains to the potential development of an overreliance on automated systems among students, which may potentially hinder the cultivation of independent creative thinking and traditional design skills—such as manual sketching and compositional analysis—that are indispensable components of a comprehensive design education. Furthermore, the utilisation of generative AI gives rise to significant copyright concerns, as these models have the capacity to generate content based on copyrighted datasets without appropriate attribution, thereby potentially infringing upon intellectual property rights.

The practical significance of this research lies in its formulation of targeted recommendations for the effective integration of AI into the design curriculum. It is recommended that the integration of AI technologies be implemented in a phased manner, commencing with introductory classes, practical projects, brainstorming sessions, and creative competitions. Furthermore, educational programmes should be designed to combine digital tools with traditional design techniques, ensuring that the benefits of technological automation do not come at the expense of fundamental artistic skills.

Future research should aim to refine the methodological framework for AI integration in design education, assess its long-term impact on students' cognitive and creative development, and develop robust strategies to mitigate the risks associated with excessive reliance on automated systems. The findings of this study substantiate the viability and necessity of integrating AI into design education, provided that its implementation is supported by rigorous methodological guidance that balances technological innovation with the preservation of traditional design competencies..

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