Enhancing Interior Design Education Through the Integration of AIGC Tools: A Novel "Creator-Thon" Approach

1st Xiaomei Li
College of Design and Innovation
Tongji University
Shanghai, China
lixiaomei@tongji.edu.cn

2nd Lei Xia
College of Design and Innovation
Tongji University
Shanghai, China
2210908@tongji.edn.cn

3rd Ziming He
College of Design and Innovation
Tongji University
Shanghai, China
2110953@tongji.edu.cn

4th Pengfei Wu
College of Design and Innovation
Tongji University
Shanghai, China
willwu@tongji.edu.cn

5th Danyang Chen
College of Design and Innovation
Tongji University
Shanghai, China
danyangchen@tongji.edu.cn

6th Ling Fan*
College of Design and Innovation
Tongji University, Tezign
Shanghai, China
lfan@tongji.edu.cn

***Abstract*—This innovative practice full paper proposes Creator-Thon, a novel teaching project designed to introduce Generative AI into traditional interior design workflows. The project adopts an interdisciplinary approach including application scenario investigation, workflow construction, collaborative innovation, and iterative optimization. The underlying research is grounded in a six-level goal hierarchy, comprising sub-goals of integrating AI capabilities and design knowledge, embedding AI skills into workflows, enhancing the learning engagement, empowering personal career development, fostering (human-AI and human-human) collaboration, and transforming the design paradigms. The teaching framework is progressively refined across multiple iterations, enhancing learning engagement by simplifying tool operations, refining design language, and re-engineering the design process. The findings underscore that integration of authentic application scenarios markedly boosts engagement and motivation among learners, modular instruction also enhances teaching quality and practical skills, and the adaptive optimization of the teaching framework informed by participants' feedback, is key to a successful Generative AI involved interior design pedagogy. This work provides insights that contribute to the application of Generative AI technology in interior design education and practice, facilitating transformations and progress in AI literacy in the field.**

Keywords—generative AI, interior design education, interdisciplinary collaboration, iterative optimization

I. Introduction

Generative artificial intelligence (GenAI) has emerged as one of the most remarkable branches of artificial intelligence, triggering a revolutionary wave across various domains [1]. As a wide-influential field of creative industry, interior design also faces unprecedented opportunities and challenges presented with GenAI. The traditional interior design requires designers to invest significant time and effort in conceptualization, drawing, and modification [2]. The emergence of GenAI provides designers with a novel assistive tool that has the potential to significantly enhance design efficiency and creativity [3].

However, the application and learning process of GenAI often poses significant challenges for designers without technical background, including operational complexity, conceptual confusion and misunderstanding, inability of mapping technologies with design problems, and the disconnection between traditional design workflows and AI capabilities [4], [5]. These limitations hinder user experiences and design outcomes, ultimately undermining the acceptance of AI technologies in design practices.

To address these challenges, we developed a teaching project called "Creator-Thon". This project aims to support universities, enterprises, and organizations to enhance their understanding the knowledge and skills about GenAI through workshop courses. The teaching framework is progressively improved based on the evaluations of participants' feedback. The project seeks to promote the application of GenAI in practical design work through systematic and adaptive optimized teaching framework and in-personal teaching practices.

This paper provides a systematic framework of course planning, implementation and evaluation for cultivating and advancing AI literacy in creative fields. Based on insights gained from analyzing the iterations of the teaching process and participant feedback, this research also centers on a broader goal structured as a six-level hierarchy, progressively advancing from integrating AI capabilities and design knowledge, embedding AI skills into workflows, enhancing learning engagement, empowering personal career development, fostering meaningful human-AI and human-human collaborations, and ultimately transforming design paradigms.

II. Related Works

A. (Gen)AI in Interior Design

AI technology is being used to optimize interior design processes by automating the generation of sketches and simulations, enhancing efficiency and accuracy [6]. Lee et al. explored the applicability of image generation technology in architectural and interior design visualizations, highlighting its expressiveness and efficiency in early design planning [7]. Autodesk's Generative Design tool uses algorithms to explore and optimize design solutions [8], while Li et al. proposed a GenAI-based method for transforming sketches into 3D models [9]. However, Dalton et al. found that designers' acceptance and willingness to use AI tools are influenced by adaptability and complexity [10]. He et al. noted that early adopters encountered challenges, affecting their confidence and willingness to integrate AI into workflows [11]. Therefore, promoting Generative AI technology requires not only tool popularization but also guiding designers to find the optimal balance in human-machine collaboration [12].

Empirical studies focus on investigating the integration of GenAI tools into interior design process. Noaman and Hussein notes the importance of designers' co-evolving, AI tools inspire and enhance the design process, improving efficiency and creativity while assisting designers rather than replacing them [3]. Wu et al. introduce methods of constructing dataset and dedicated models, providing feasible solutions for adopting AI capabilities in specific design scenarios [13]. Yin et al. highlight that GenAI excels in mastering design styles and generating multiple outputs, which enables iterative refinement of commissioned designs. Through systematic, experiential training, participants gained an understanding of Generative AI's application and advantages in the design process, particularly in enhancing efficiency and facilitating innovation [14].

GenAI shows broad prospects in interior design education and practice. However, integrating these tools within traditional workflows and leveraging human-machine collaboration requires further exploration. We look forward to promoting Generative AI's application and development in interior design through interdisciplinary teaching and research.

B. Interdisciplinary Teaching and Learning with GenAI

Emerging GenAI tools, such as ChatGPT [15] and Midjourney [16], are increasingly being used in education to support innovative teaching and learning methods. These tools have the potential to enhance learning experiences, provide personalized support, and foster creativity [17]. Zawacki-Richter et al. showed that Generative AI technology can offer customized content and feedback based on individual needs and learning styles, improving outcomes and engagement [18]. This aligns with our observations during the Creator-Thon, where participants believed GenAI tools brought new possibilities and augmented creativity in interior design education.

Interdisciplinary teaching methods are highly effective in cultivating critical thinking and innovation [19]. Integrating knowledge from different disciplines helps students acquire comprehensive skills and tackle complex problems [20]. Ioannou emphasized that interdisciplinary teaching fosters creativity, collaboration, and problem-solving, preparing students for future challenges [21]. This supports our Creator-Thon practice, where combining GenAI with traditional interior design teaching creates an interdisciplinary environment that expands perspectives and enhances competences in using AI for innovative practices.

III. Methods and Progressive Evaluation

The Creator-Thon workshop is initiated by an academic team focusing on the studies about AI and design integration. The name "Creator-Thon" is derived from the combination of "creator" and "marathon", implying the long-term commitment for the larger body of research on revamping the creative process with AI technologies. This course is a sub-project collaborating with professional design companies, aimed at enhancing interior design through the application of GenAI. The teaching framework is adaptively improved in the progress, the contents and procedures are adjusted regarding the feedback and evaluation data collected after each workshop.

A. Course Planning

The course is organized through active communication and interviews with the partnering company's members to understand their practical needs and ensure the teaching effectiveness. The course format is designed as a participatory design workshop, which fosters hands-on engagement and collaborative learning.

Participants: Designers with professional experience and a keen interest in adopting new technologies into their practices.

Schedule: 2 days (introduction day and practicing day), 6 hours per day, from 9am to 12am in the morning, lunch break, and from 2pm to 5pm in the afternoon.

Tools and Materials: Personal laptops or tablets, ChatGPT [15], Midjourney [16], Stable Diffusion [22], Muse-AI [23], Kimi-AI [24].

Procedure: The course procedure adopts the "lecture + hands-on" model, comprising two main parts: theoretical session and practical session:

- Theoretical Session: Introducing the principles of Generative AI technology and the methods of using the tools. Example cases are employed and well examined to introduce the principles of key technologies such as diffusion models [25], [26], LoRA [27], and ControlNet [28], helping participants better understand the mechanisms and possible use cases. The functional features and techniques are also thoroughly explained, ensuring that participants could quickly grasp the basic skills of using these tools. The participants are also encouraged to actively pose questions or engage in discussions during the session.
- Practical Session: Relevant application scenarios of interior design are selected to guided participants to apply the acquired knowledge for specific design tasks, including generating client's portraits for further design positioning and requirement interpretation with Large Language Models (LLMs), generating high-quality renderings from sketches or reference images using ControlNet and Text-to-Image (T2I) models, and adding, removing or replacing elements from existing image with inpainting technique. The in-personal hands-on experience facilitates the learners to internalize the skills within the context related to their actual practices.

The course encourages the participants to actively engage with these tools and explore creative ideas and combinations. An assistant team accompanies throughout the workshop, offering immediate support to overcome any technical or conceptual problems that may hinder the learning process. This interactive and experiential approach engages participants to effectively comprehend the practical skills of Generative AI tools, facilitating deeper integration of the new technologies into their design practices.

B. Teaching Framework and Optimization

1) Workshop I

a) Teaching Framework

The initial workshop focused on technological end, starting with the theoretical session, the invited experts give the general introduction, and share their insights and prospects of GenAI in related creative industries. The session then goes on introducing the concepts, technological features and mechanisms, such as the denoising process of diffusion models, the parameter efficiency feature of LoRA, and conditional control

mechanism of ControlNet, etc., supporting participants to establish a comprehensive understanding of GenAI's technological features. The functionalities of various accessible GenAI tools are also introduced and explained in-depth, equipping the participants with broader view of knowledge and wider range of choices.

The practical session begins with operational tutorials about various features and usages of T2I model, we integrated them into three curated tasks that incrementally increase in complexity and advancement in objectives:

- Task A: introduces basic operations of text to image generation, such as prompt structuring, parameter adjustment, and model evaluation and selection, building up their initial impression with GenAI tools.
- Task B: introduces image control techniques for generating fine-rendered images from sketches, demonstrating the controllability for implementing diverse design tasks.
- Task C: introduces model training techniques of training a tailored model for generating design images with particular styles and elements, further strengthening the controllability and diversity of the schemes.

An additional competition session is conducted after the tutorials, where participants are required to complete a short design proposal within time limit. The participants freely group up as teams, each team will discuss their views on GenAI, brainstorm and collectively complete the proposal with introduced tools. After completion, the teams are asked to present their thoughts and ideas in the proposal as well as the perception on GenAI. This approach augments the personal experience of GenAI tools improving efficiency and creativity, also promotes the collective learning. The initial teaching framework outline is shown in TABLE I.

b) Evaluation

The effectiveness of the workshop is evaluated through the questionnaire shown in TABLE II. This questionnaire assesses aspects from the workshop quality to the participants' views on applying GenAI to practical work, rated with scale of 0-10. Out of the 50 questionnaires sent out, we received 38 valid responses, from the received responses:

- The "Overall Contents" received 74% for score between 8-10, displaying a positive evaluation of the content arrangement and organization. This indicates the workshop well-covered the key areas of GenAI relating to interior design, the content was reasonably designed and well-structured. There are also some lower ratings with feedback stating that some technical-intensive contents are too abstract to comprehend, suggesting a need for better alignment with participants' background.
- The "Skill Mastery" received 61% of score between 8-10, a relatively high level of tool mastery in general. 29% of score between 6-8 shows some participants felt difficulty, and even 2% reported rather low mastery level. This data indicates the need for adjustment to mitigate the difficulty.
- The "Teaching Satisfaction" received 79% of score between 8-10, indicating a high level of satisfaction among most participants, while 21% of scores between 6-8 suggest there is room for improvement, the feedback states the disconnection between teaching method and participants' practical work, highlighting the need for a more integrated approach that aligns tutorials with real-world practice.
- The "Future Use in Work" received 47% of score between 8-10 and 32% of scores between 6-8, indicating a moderately positive inclination of most participants towards future engagement with GenAI in their works. The lower ratings, 13% in the 4-6 and 8% in 0-4, highlighting the need for deeper investigation into the context of their practical works.

TABLE I. OUTLINE OF WORKSHOP I

Sessions	Contents	Method	Time
Theory	General introduction	Lecture	30%
	Technicial features		
	Functionalities and usages		
Practice	A: prompt, parameters, model	Lecture Hands-on	40%
	B: Image control techniques		
	C: Model training		
Competition	Design proposal	Hands-on	30%

TABLE II. EVALUATION ON WORKSHOP I

NO.	Questions	8-10	6-8	4-6	0-4
Q1	Overall Contents	74%	26%	5%	0
Q2	Skill Mastery	61%	29%	8%	2%
Q3	Teaching Satisfaction	79%	21%	0	0
Q4	Future Use in Work	47%	32%	13%	8%

TABLE III. ROLE OF JOB DISTRIBUTION OF SCORES BELOW 8

Role of Job	Q1	Q2	Q3	Q4
Requirement Analysis	2	0	1	2
Data Analysis	0	3	1	0
Conceptual Design	0	0	2	0
Rendering	0	0	0	0
Detailed Design	2	4	0	11
Construction Design	3	5	0	5
Furnishing	1	3	3	3
Feedback	2	0	2	0

The results indicate that participants have showen stronger acceptance of the relatively unfamiliar GenAI technology, successfully acquiring a certain level of skill in a short time. However, due to their proficiency with the new tools and their ability to transfer knowledge, designers' willingness to use these tools in the future was somewhat limited. Based on these findings, we implemented targeted improvements, leading to the upgrades to the teaching framework workshop II.

2) Workshop II

a) Problem Acquisition

Addressing the main issues revealed in workshop I: (1) the abstractness of technical details raising the difficulty in tool mastery, and (2) the disconnection between GenAI functionalities and practical work lowering the willingness to use in

future work, we conducted interviews focusing on investigating participants' specific working process. As the result shown in TABLE III. , the lower scores are predominantly concentrated in more specific areas such as detail design, furnishing and construction design. This suggests that participants may find these particular aspects of the design process to be more challenging or in need of improvement compared to other broader categories.

In real-world scenario of these stages, designers need to carry out detailed and refined design based on the conceptual outcomes, considering specific details, client requirements, material limitations, furnishing styles, and the budgets. These workflows require a high level of accuracy and combinations of multiple objectives, which are challenging for current GenAI tools due to their inherent limitations. Specifically, feedback from participants highlighted challenges of the significant mismatching between their ideas and the outputs. This issue is particularly exacerbated by the inability of effectively crafting prompts and choosing models.

b) Teaching Framework Optimization

In workshop II, we focus on integrating GenAI tools into the workflows of interior design, enhancing the following aspects based on the original framework:

- **Design language-based prompt**. We introduced design language-based prompt structure to help participants relating the professional terminology with AI generative workflow, such as "color matching", " "spatial layout", and "style positioning". We systematically mapped the connections between design languages and, helping participants to efficiently deliver the design intentions to GenAI models.
- **Structuralized prompt dictionary.** To further assist participants to craft more effective prompts, we summarized the structure for interior design prompt crafting: "*space category + specific area + objects+ decoration + design style + color scheme + lighting features + rendering mode + effect enhancement.*" We also developed a detailed dictionary with fill-in vocabulary for each component within the structure, enhancing participants' prompting skills (Fig.1).
- **Tailored image control workflow.** Through interviewing the participants, the main challenges are reflected in image local modifications, view angle control, and tool usage. To address these issues lowering working effectiveness, we developed an advanced image control workflow tailored for various image modification needs in interior design, such as background re-drawing, detail modifying, and re-lighting (Fig.2). The workflow is documented as a step-by-step guide for participants to follow in the workshop. This guide is designed to ensure a clear and structured approach to the tasks at hand, facilitating ease of understanding and execution.

Through the optimization with supplementation of the above content, the teaching framework resolves the main challenges in workshop I, enhancing the participants' ability to navigate more design-oriented tasks. This refined framework fosters a deeper engagement with design practices, further aligned the workshop with its core objectives of enhancing the creative process of interior design with GenAI.

c) Evaluation

With the upgraded teaching framework with optimizations of design language-based prompt, structuralized prompt dictionary and tailored image control workflow, the challenging aspects of theoretical understanding, skill mastery, and practical application are significantly improved. To accurately compare the result of the two workshops, the evaluation is done using the same questionnaire and received 48 valid responses out of 60 sent out. The results are shown in TABLE IV.

TABLE IV. EVALUATION ON WORKSHOP II

NO.	Questions	8-10	6-8	4-6	0-4
Q1	Overall Contents	87.5%	12.5%	0	0
Q2	Skill Mastery	79.1%	16.6%	4.3%	0
Q3	Teaching Satisfaction	83.3%	16.6%	0	0
Q4	Future Use in Work	83.3%	26.6%	0	0

The feedback indicates the integration of design language-based prompt enabled them to efficiently deliver the design intentions and fully leverage the generative capabilities of AI tools. The structuralized prompt dictionary helped them iteratively improve prompt structures based on their professional expertise and better control of the outputs through text descriptions. The tailored image control workflow reduced the time-consuming and repetitive workloads in the traditional design process. The subsequent willingness to use, compared to workshop I, increased by nearly 40%.

However, a new issue emerged: the teaching modules primarily focused on tool learning, with limited use of real design cases for simulated application. As a result, participants may struggle to apply their knowledge flexibly in knowledge transfer and future use. Although they have mastered basic AI tool operations and techniques, the lack of practice and feedback in real-world scenarios could leave them uncertain when tackling actual design projects. To address this issue, we plan to incorporate real-world design cases into future teaching framework, enabling participants to apply their acquired knowledge to actual design scenarios while learning GenAI tools. This approach will help participants better understand the role of GenAI in the design process and learn to adapt and optimize their use according to specific context.

3) Workshop III

a) Problem Acquisition

The interior design process comprising stages of conceptual design, schematic design, rendering presentation, detailed design, and construction design. Based on previous studies, we identified GenAI tool's extensive potential in most of the stages. Specifically, T2I models and LLMs can be involved in multiple stages, providing supports on various design tasks. In workshop III, we adopted the "Project-based Learning" (PBL) framework [29], incorporating GenAI into real-world design tasks, and integrate them into the workshop teaching framework, merging with the theoretical and practical components.

First, we systematically identified the major tasks and objectives at each stage and mapped out the related GenAI application (Fig. 3). Next, we use real design project as context, guiding participants in applying AI tools during the design process while providing timely feedback and guidance. Finally, participants complete a full design project, enabling them to consolidate their knowledge, enhance their

Prompt Stucture: The interior (design) of a _____ **(Space category)** 's _____ **(Spatial area)**, with _____ **(Main objects)** , plus the _____ **(Other decorative elements)**as the decoration, _____ **(design style)**, _____ **(color scheme)**,_____ **(expression method)**, _____ **(lighting characteristics)**, _____ **(ambiance)**, _____ **(effect enhancement)**

Space category	Spatial area	Main objects	Other decorative elements	Design style	Color scheme	Expression method	Lighting characteristics	Ambiance	Effect enhancement
apartment	bedroom	wooden door	curtains	art deco style	moss green + tan + white	3D Model	accent lighting	strange	hyper photorealistic
	bathroom	glass door	cushions	art nouveau	gray + sand + blue	3ds Max	afternoon	ancient	hyper-realistic
	living room	mild steel door	bedding and mattresse	baroque style	hunter green + red	Arnold Render	artificial lighting	award-winning	ultra-detailed
	kitchen	aluminium door	wall hangings and tapest	bauhaus style	blue + neon	Blender Render	backlighting	simple	masterpiece
	cloak room	Bi-fold doors	rugs	bohemian style	light blue + emerald	CGsociety	beautiful lighting	beautiful	trend on artstation
	balcony	Double-Hung Window	carpets	contemporary	blue + grass green	Cinema4D Render	blue hour	calm	vivid
house	bedroom	Casement Window	wall print	vintage	blue + beige	CryEngine	bright lighting	chaotic	intricate
	bathroom	Bay Window	candles	nordic style	gray + brown	Cycles Render	lit by candlelight	cheerful	high quality
	living room	Bow Window	table lamp	loft style	black + red	Daz 3D	Christmas lighting	clean	detailed
	kitchen	Jalousie Window	floor lamp	industrial style	gray green + white + black	DeviantArt	cinematic lighting	colorful	trend on artstation
	cloak room	Palladian Window	mirror	urban modern style	blue + gray + taupe	DirectX Render	colored lighting	cozy	8k
	balcony	Sliding Sash Window	sculpture	tropical style	black + navy	Doughy Render	twilight	cute	
	staircase	Hardwood Flooring	vase	minimalist style	emerald + tan	Houdini Render	dark lighting	depressing	
	roof terrace	Engineered Wood Flooring	indoor plants	coastal style	forest green + light gray	Infini-D Render	dawn	dreamy	
villa	bedroom	Vinyl Flooring	dried flowers	hollywood regency style	yellow + gray	KitBash3D	daylight	ecstatic	
	bathroom	Tile Flooring		french style	pink + green	Luxcore Render	daytime	harmony	
	living room	Stone Flooring		mediterranean style	blush pink + black	Mental Ray Render	subdued lighting	fancy	
	kitchen	Carpet Flooring		mid-century style	black + white	Octane Render	dramatic lighting	blurry	
	cloak room	stucco wall		maximalist style	blue + white	Optix Render	evening	gloomy	
	balcony	brick wall		shabby chic style	turquoise + cream	Photobashed	film lighting	gorgeous	
	staircase	stone cladding wall		scandinavian style	viridian green +purple	Photoshop	lit by firelight	happy	
	roof terrace	wood paneling wall		rustic style	gold + royalblue	Raylectron Render	flickering light	joyful	
work space	Private office	concrete wall		tribal style	rosewood + mossygreen	Redshift Render	floodlight	solitary	
		tiled wall		gothic style	baby blue + pearly pink	Substance 3D	fluorescent light	serenity	

Fig. 1. Structuralized Prompt Grammar Dictionary

Collage image generation effect diagram	Black mask on white background	Modernist style-Prompt	Japanese Wabi-Sabi style - Prompt	Chinese vintage style-Prompt
Original image	Command	Elegant and orderly,(Modern Interior Design:1.3),(Scandinavian Tranquillity Style:1.4),gray and gold,Luxurious yet serene,superb,-master piece,Fuji XT3,8K,best quality,photography	Elegant and orderly,(Modern Interior Design:1.3),Rough Texture,(wabi-sabi style:1.2),gray and white,superb,master piece,Fuji XT3,8K,best quality,photography	Elegant and orderly,(Modern Interio Design:1.3),Rough Texture,(Chinese Retro Style:1.4),(red and brown:1.2),superb,master piece,Fuji XT3,8K,best quality,photography
				

Fig. 2. Image control workflow tailored for advanced modifications in interior design

proficiency with AI tools, and improve their ability to transfer knowledge through practical experience.

b) Teaching Framework Optimization

In workshop III, based on the improvements from previous sessions, we integrate the teaching framework into the context with specific design objectives, reconstructing the course procedure according to the design workflow, into a series of progressive task-tutorial pairs:

- Define the requirement: Renovating a 3-story building in the old Ximenkou area of Shanghai into a contemporary art museum.
- Requirement analysis: regional analysis, site analysis, user profile, design objective analysis, and design scheme.
- Task-based tutorials: principles and usage of LLM, assisting analytical tasks with LLM.
- Conceptual design: design objectives, material, spatial atmosphere, layout organization, lifestyle presentation, etc.
- Task-based tutorials: assisting ideations with LLM, improve expression structure, generate specific expression methods, and their operation techniques.
- Rendering: generating spatial renderings, exploring styles, furnishing, lighting, multi-perspective renderings, etc.
- Task-based tutorials: text-to-image generation, prompt structure, and control of image generation angles.
- Detailed design: local modification of renderings, furniture modification, layout modification, etc.
- Task-based tutorials: ControlNet, LoRA, image consistency control, parameter adjustment, etc.
- Soft decoration design: decoration details, furniture, material, color scheme, etc.
- Task-based tutorials: model training, model fine-tuning, combining prompts with ControlNet model operation, parameter adjustment, etc.

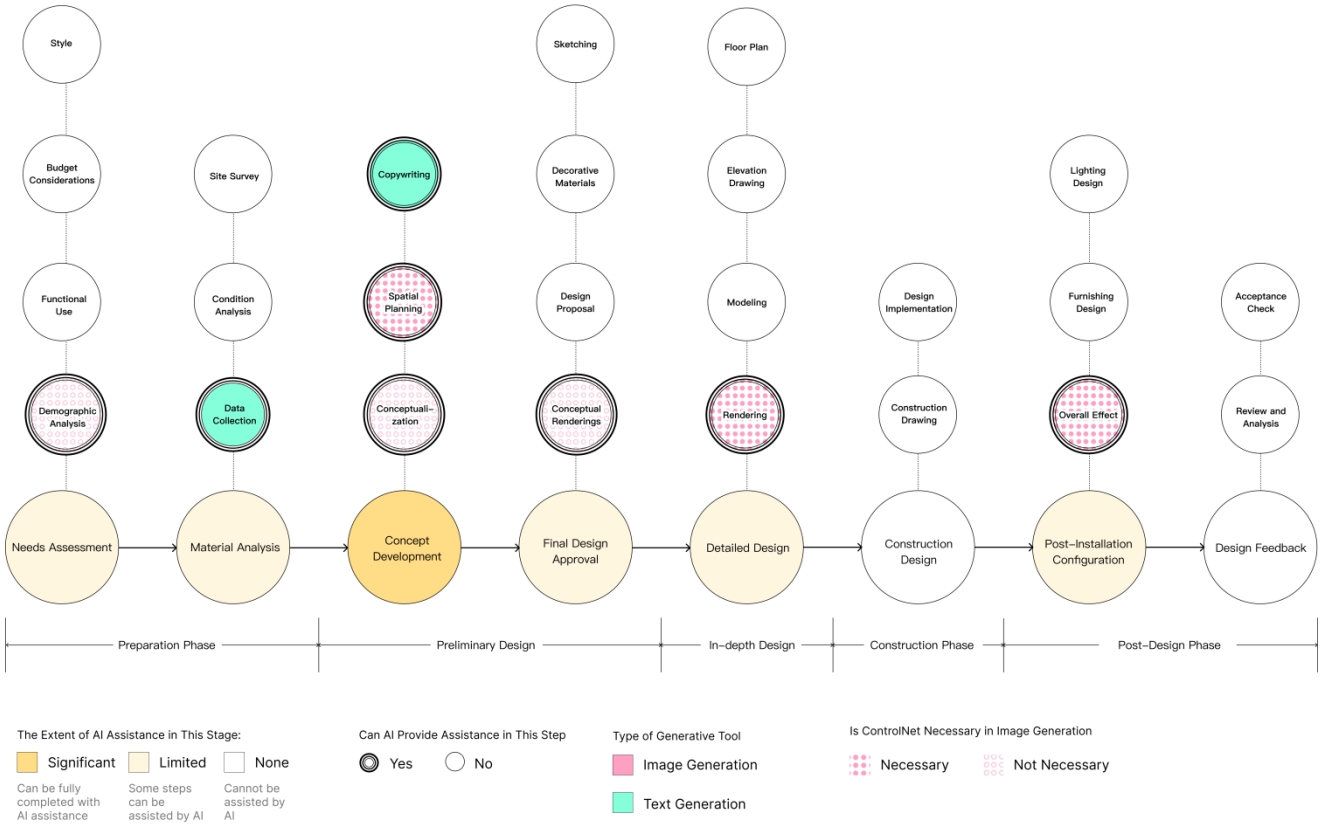

Fig. 3. Generative AI Tool Capabilities in Interior Design Workflow

More detailed structure and contents of the framework are shown in TABLE VI.

c) Evaluation:

Workshop III was conducted with 101 designers from the third company. The teaching framework, structured around the design process and paired with tailored tutorials, effectively bridged the gap between AI usage and participants' actual practice. The effectiveness of the current teaching framework was assessed using a four-dimensional scale, with 75 valid responses received from the 101 issued questionnaires. The results are presented in TABLE V.

From the evaluation results of workshop III, the "Overall Content" scale reached 97.3%, showing a significant increase of 23.3% from Workshop I and 9.8% from workshop II. The "Skill Mastery" scale also saw a rise, increasing by 25.7% and 7.6% compared to workshops I and II, respectively. Notably, the "Future Use in Work" scale experienced a substantial increase of 43.7% from workshop I and 7.4% from workshop II.

These results indicate a marked improvement in the effectiveness of the teaching framework as it evolved through the workshops. The significant gains in "Overall Content" and "Skill Mastery" suggest that the refined approach, which emphasizes tailored tutorials within practical context, has better aligned with the participants' background. The dramatic increase in the "Future Use in Work" scale is particularly noteworthy, as it reflects a growing confidence among participants in incorporating AI tools into their professional practice. This trend suggests that as the teaching framework becomes more closely integrated with real-world design context, participants are more likely to adopt and utilize AI technologies in their work, which indicates the importance of the situated context.

TABLE V. EVALUATION ON WORKSHOP III

NO.	Questions	8-10	6-8	4-6	0-4
Q1	Overall Contents	97.3%	2.7%	0	0
Q2	Skill Mastery	86.7%	10.7%	2.6%	0
Q3	Teaching Satisfaction	97.3%	2.7%	0	0
Q4	Future Use in Work	90.7%	6.7%	2.6%	0

IV. RESULT AND DISCUSSION

Through three iterations of teaching framework optimization, we developed a set of teaching methods that effectively promote the integration of GenAI into interior design workflows. In the final workshop, we adopted a combination of quantitative and qualitative methods to comprehensively and objectively evaluate teaching effectiveness. By collecting and analyzing multi-dimensional data from sources such as questionnaires and interviews, we observed a continuous improvement in participants' satisfaction with the course content, teaching methods, and learning outcomes with each iteration. In workshop I, most participants gave positive feedback, yet some reported that the difficulties in theoretical session and insufficient time for practice. In subsequent workshop II and III, we further enriched the content, balanced the lecture and practice, optimized teaching methods and procedure, and aligned the teaching context with participants' background. In the final questionnaire, 97.3% of participants expressed high satisfaction with the overall quality, an increase of 4.71% and

TABLE VI. TEACHING FRAMEWORK - CREATOR-THON

Teaching Segment	Teaching Content	Teaching Module	Time Allocation	Teaching Objectives
Introductory Lecture	Principles of Generative AI, Industry Application Cases		2 hours	Stimulate participants' enthusiasm Establish connection with their own work
Teaching Workshop	Application of LLM in Design	Requirements Analysis, Conceptual Design	10 hours	Usage Methods of AI Tools
	Text-to-Image Generation	Conceptual Design, Rendering Design		
	Image Control Strategies	Rendering Design, Detailed Design		
	Model Training	Rendering Design, Detailed Design		
Challenge Competition	Real Design Projects	AI-Assisted Design Throughout the Entire Process	2 hours	Improving AI-Based Design Workflows
Exchange and Feedback	Sharing of Design Solutions	Exchange	1 hour	Practical Reflection, Summary

9.43% compared to the previous two, demonstrating the effectiveness of continuous optimization.

Moreover, the improvement in knowledge and skill mastery boosted participants' confidence and influenced their determination to use AI technology in subsequent work. The Creator-Thon project received high praise from industry experts and partners, who considered it a successful, innovative, and inspiring teaching practice that provided valuable experience for promoting the integration of GenAI with interior design. Many industry institutions also actively contacted us, expressing their desire to collaborate on similar projects and promote the concept of GenAI-empowered education in a broader scope in creative fields.

Many designers posed concerns about non-technical factors, such as concerns that relying on AI might diminish personal creativity or difficulties in selecting from the vast quantities of generated images. This indicates that promoting GenAI applications should focus not only on tool adoption and operational training but also on guiding designers to find the optimal balance in human-machine collaboration.

Through the teaching framework development incorporating designers' insights and real-world design context, the GenAI-immersed approach of our Creator-Thon project has significantly expanded the content and methods of design education, opening new avenues for nurturing future creative talents. This systematic, experiential training has not only enhanced designers' ability to leverage AI for design innovation but also greatly augmented their creative potential, accelerating the adoption of AI technology in the field of interior design.

V. LIMITATIONS AND FUTURE WORKS

Despite the promising result demonstrated by improving the teaching framework, this project also highlighted some shortcomings, particularly in the evaluation methods and teaching approaches, which require further refinement. Future workshops should incorporate a broader range of qualitative and quantitative assessment tools, such as pre- and post-project comparative analyses and long-term tracking of participants' professional development, to more comprehensively evaluate the teaching effectiveness and the long-term impact of the technology. The scope of data collection capturing participants' personal nuances should also be expanded. Factors such as age, design preferences, and work experience may interact with the application of GenAI in interior design, potentially influencing outcomes. In future research, we aim to expand the sample size and gather more nuanced participant information, with permission, to thoroughly explore correlations and potential causal relationships between personal factors and outcomes. As the design progressed in-depth, designers' need for precise image control notably increased, especially when using ControlNet technology for fine detail adjustments. Future research could delve deeper into designers' specific functional needs throughout the design process and how these needs evolve over time. We plan to explore more practical cases to enhance the depth and richness of our research, ensuring that the proposed framework is both reliable and broadly applicable.

Moreover, teaching methods should be further diversified. For instance, modular teaching could be introduced, allowing participants to choose different learning modules based on their progress and interests. Additionally, establishing real-time online collaboration platforms would enable participants to iterate on design solutions with immediate feedback from instructors and peers, enhancing the interactivity of learning and improving the flexibility and effectiveness of teaching. The participants predominantly come from non-technical backgrounds and have a limited understanding of GenAI principles. Future Creator-Thons should also consider adopting more intuitive approaches, such as the unplugged methods introduced by Franz Jetzinger et al. in course design [30], to help non-technical participants better understand AI principles.

VI. CONCLUSION

This project involves interior designers in an immersive two-day Creator-Thon workshop, introducing them to various GenAI tools and exploring a teaching framework that enables designers to apply GenAI skills to their actual work. The research preliminarily validated the potential of GenAI technology in the field of interior design. Findings suggest that the use of GenAI tools can enrich designers' toolkits, enhancing

their adaptability and efficiency across various projects by nuanced integration within the context and aligning the actual needs.

It is important to note that GenAI technology does not redefine the entire interior design workflow but rather enhances the efficiency of each step within the process. As current research is still in its early stages, the key to future studies will be understanding how the designers' agency and the AI capabilities can positively interact. We anticipate further exploration and collaboration among scholars to jointly advance the development of generative AI technology, driving the transformation of interior design practices.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to our fellow students who collaborated with us in designing the teaching content, the instructors and teaching assistants of the Creator-Thon workshop for their guidance and support, and the three interior design companies for their partnership and valuable insights. Their contributions have greatly enriched this research and made it more relevant to real-world applications. We also extend our thanks to the organizations that provided funding for this research, making it possible to conduct this study.

REFERENCES

[1] S. Feuerriegel, J. Hartmann, C. Janiesch, and P. Zschech, "Generative AI," *Bus Inf Syst Eng*, vol. 66, no. 1, pp. 111–126, Feb. 2024,

[2] C. Coleman, *Interior design practice*. New York: Allworth Press : Interior Design, 2010.

[3] S. ş. Noaman and G. K. Hussein, "Improving Design Efficiency Using Artificial Intelligence: A Study on the Role of Artificial Intelligence in Streamlining the Interior Design Process," *International Design Journal*, vol. 13, no. 5, pp. 255–270, Sep. 2023,

[4] R. Shelby, S. Rismani, and N. Rostamzadeh, "Generative AI in Creative Practice: ML-Artist Folk Theories of T2I Use, Harm, and Harm-Reduction," in *Proceedings of the CHI Conference on Human Factors in Computing Systems*, Honolulu HI USA: ACM, May 2024, pp. 1–17.

[5] Y. Sun, E. Jang, F. Ma, and T. Wang, "Generative AI in the Wild: Prospects, Challenges, and Strategies," in *Proceedings of the CHI Conference on Human Factors in Computing Systems*, in CHI '24. New York, NY, USA: Association for Computing Machinery, May 2024, pp. 1–16.

[6] N. Soni, A. Aloba, K. S. Morga, P. J. Wisniewski, and L. Anthony, "A Framework of Touchscreen Interaction Design Recommendations for Children (TIDRC): Characterizing the Gap between Research Evidence and Design Practice," in *Proceedings of the 18th ACM International Conference on Interaction Design and Children*, in IDC '19. New York, NY, USA: Association for Computing Machinery, Jun. 2019, pp. 419–431.

[7] J.-K. Lee *et al.*, "How to Enhance Architectural Visualisation Using Image Gen AI," in *Multimodality in Architecture: Collaboration, Technology and Education*, J. H. Lee, M. J. Ostwald, and M. J. Kim, Eds., Cham: Springer Nature Switzerland, 2024, pp. 157–173.

[8] D. Nagy *et al.*, "Project discover: an application of generative design for architectural space planning," in *Proceedings of the Symposium on Simulation for Architecture and Urban Design*, in SIMAUD '17. San Diego, CA, USA: Society for Computer Simulation International, May 2017, pp. 1–8.

[9] P. Li, B. Li, and Z. Li, "Sketch-to-Architecture: Generative AI-aided Architectural Design." arXiv, Mar. 29, 2024.

[10] N. S. Dalton, *Architecture and interaction: human computer interaction in space and place*. New York, NY: Springer Berlin Heidelberg, 2016.

[11] Z. He, X. Li, L. Fan, and H. J. Wang, "Revamping Interior Design Workflow Through Generative Artificial Intelligence".

[12] U. A. Usmani, A. Happonen, and J. Watada, "Human-Centered Artificial Intelligence: Designing for User Empowerment and Ethical Considerations," in *2023 5th International Congress on Human-Computer Interaction, Optimization and Robotic Applications (HORA)*, Jun. 2023, pp. 1–7.

[13] W. Wu *et al.*, "Data-driven interior plan generation for residential buildings," *ACM Transactions on Graphics*, vol. 38, no. 6, pp. 1–12, Nov. 2019,

[14] H. Yin, Z. Zhang, and Y. Liu, "The Exploration of Integrating the Midjourney Artificial Intelligence Generated Content Tool into Design Systems to Direct Designers towards Future-Oriented Innovation," *Systems*, vol. 11, no. 12, Art. no. 12, Dec. 2023,

[15] "ChatGPT | OpenAI." Accessed: Aug. 20, 2024. [Online]. Available: https://openai.com/chatgpt/

[16] "Midjourney," Midjourney. Accessed: Aug. 20, 2024. [Online]. Available: https://www.midjourney.com/website

[17] M. Resnick, "Generative AI and Creative Learning: Concerns, Opportunities, and Choices," *An MIT Exploration of Generative AI*, Mar. 2024,

[18] O. Zawacki-Richter, V. I. Marín, M. Bond, and F. Gouverneur, "Systematic review of research on artificial intelligence applications in higher education – where are the educators?," *Int J Educ Technol High Educ*, vol. 16, no. 1, p. 39, Oct. 2019,

[19] J. Gess-Newsome, J. A. Taylor, J. Carlson, A. L. Gardner, C. D. Wilson, and M. A. M. Stuhlsatz, "Teacher pedagogical content knowledge, practice, and student achievement†," *International Journal of Science Education*, vol. 41, no. 7, pp. 944–963, May 2019,

[20] L. D. English, "STEM education K-12: perspectives on integration," *International Journal of STEM Education*, vol. 3, no. 1, p. 3, Mar. 2016,

[21] O. Ioannou, "Opening up design studio education using blended and networked formats," *Int J Educ Technol High Educ*, vol. 15, no. 1, p. 47, Dec. 2018,

[22] R. Rombach, A. Blattmann, D. Lorenz, P. Esser, and B. Ommer, "High-Resolution Image Synthesis with Latent Diffusion Models," presented at the 2022 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), IEEE Computer Society, Jun. 2022, pp. 10674–10685.

[23] "MuseAI." Accessed: Aug. 20, 2024. [Online]. Available: https://museai.cc/

[24] "Kimi.ai." Accessed: Aug. 20, 2024. [Online]. Available: https://kimi.moonshot.cn/

[25] J. Song, C. Meng, and S. Ermon, "Denoising Diffusion Implicit Models," in *International Conference on Learning Representations*, 2021.

[26] J. Ho, A. Jain, and P. Abbeel, "Denoising diffusion probabilistic models," in *Proceedings of the 34th International Conference on Neural Information Processing Systems*, in NIPS '20. Red Hook, NY, USA: Curran Associates Inc., Dec. 2020, pp. 6840–6851.

[27] E. J. Hu *et al.*, "LoRA: Low-Rank Adaptation of Large Language Models," in *International Conference on Learning Representations*, 2022.

[28] L. Zhang, A. Rao, and M. Agrawala, "Adding Conditional Control to Text-to-Image Diffusion Models," in *2023 IEEE/CVF International Conference on Computer Vision (ICCV)*, Oct. 2023, pp. 3813–3824.

[29] S. Bell, "Project-Based Learning for the 21st Century: Skills for the Future," *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, vol. 83, no. 2, pp. 39–43, Jan. 2010,

[30] F. Jetzinger, S. Baumer, and T. Michaeli, "Artificial Intelligence in Compulsory K-12 Computer Science Classrooms: A Scalable Professional Development Offer for Computer Science Teachers," in *Proceedings of the 55th ACM Technical Symposium on Computer Science Education V. 1*, in SIGCSE 2024. New York, NY, USA: Association for Computing Machinery, Mar. 2024, pp. 590–596.