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Article

The Impact of Dream Artificial Intelligence Relevance and Design Skills Proficiency on Art Education Students in Designing Innovative Decorative Units

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Abstract

This study aimed to investigate the impact of utilising the Dream Artificial Intelligence (AI) application on the ability of students in the Art Education Department to design innovative decorative units in Arabic calligraphy and ornamentation. The research was conducted in two distinct phases. In the first phase, a two-sample experimental design was employed, involving a total of 60 students equally divided into two groups: a control group of 30 students taught through conventional instructional methods, and an experimental group of 30 students who engaged with the Dream AI application. The performance of the experimental group exhibited significant enhancement, as evidenced by Eta Square (η^2) values ranging between 0.870 and 0.963, indicating notable improvements in design skills. Furthermore, the comparison between pre- and post-intervention measurements revealed a considerable effect, with Eta Square (η^2) values ranging from 0.491 to 0.890, confirming the effectiveness of the Dream AI application in fostering students' design capabilities. In the second phase, a structured questionnaire was administered to a broader sample of 350 students, from which 314 responses were collected, and 307 deemed valid for analysis. The data analysis followed a two-step process using Smart PLS, beginning with the assessment of reliability and validity, followed by the application of Structural Equation Modelling (Kasemsap, 2016) for examining both direct and moderating relationships. The results demonstrated a strong positive effect of Dream AI Relevance (DAIR) on Designing Innovative Decorative Units (DIDU) ($\beta = 0.921$, $p < 0.001$). Additionally, Creative Self-Efficacy (CSEF) had a positive influence on DIDU ($\beta = 0.032$, $p < 0.001$), whereas Design Skills Proficiency (DSPR) did not exhibit a statistically significant direct effect. Importantly, CSEF was found to significantly moderate the relationship between DAIR and DIDU ($\beta = 0.112$, $p < 0.001$), enhancing the positive impact of Dream AI on students' innovative design outputs. These findings suggest that fostering students' creative self-efficacy may optimise the advantages of AI-based tools in creative education. Consequently, the study advocates for the integration of AI applications such as Dream into the art education curriculum, alongside tailored training programmes aimed at strengthening students' creative confidence and design expertise.

Keywords

Dream AI Relevance, Design Skills Proficiency, Designing Innovative Decorative Units, SEM.

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Introduction

Background of the Topic

The rapid advancement of technology has rendered it an indispensable element of contemporary life, particularly for artists (Giannini & Bowen, 2022; Goldfarb & Lindsay, 2021). Its influence spans multiple disciplines, including decorative design, where AI has emerged as one of the most critical modern tools (Pimenov et al., 2023). AI represents a technological domain that employs a range of techniques, tools, and programmes to enable machines to perform tasks traditionally undertaken by humans (Nahavandi et al., 2022; Zhang & Lu, 2021). These AI techniques encompass voice, text, and image recognition, as well as data analysis and result generation, significantly contributing to various processes, particularly within design contexts. Moreover, the concept of interactive technology introduces a degree of flexibility that facilitates the dynamic handling of variables inherent in the design process (Hidayat, Restiandi, & Sukresna, 2025; Vieira et al., 2025). Such technologies enable the integration of novel design concepts that merge traditional and modern approaches to create digital designs. This amalgamation fosters a rich diversity of forms and colours, thus generating new visual vocabularies for contemporary decorative compositions that reflect evolving aesthetic values and cultural shifts (Sachant et al., 2023).

Artificial intelligence technologies also offer substantial advantages by reducing the time and effort necessary to accomplish various tasks while simultaneously enhancing the quality of outcomes (Acharya, Kuppan, & Divya, 2025; Feng, 2025; Varriale et al., 2025). Through AI, contemporary artistic designs distinguished by creativity and variety can be developed to meet users' expectations. Furthermore, AI applications can be adapted across a range of fields—including fine arts, interior design, advertising, and marketing—thereby augmenting artists' creative capacities not only in the conceptualisation of designs but also in their execution (Madahi, 2022). Among these applications, the Dream AI application stands out as a significant contemporary tool, offering a suite of features that enable designers to transcend conventional boundaries in producing decorative artworks and modifying traditional designs, thereby facilitating innovation. In light of these considerations, the present research was conceived to explore and validate the role of the Dream AI application in influencing Art Education Department students' ability to design innovative decorative units.

Research Problem and Questions

Developing decorative artwork poses a challenge because it requires a subtle balance between aesthetic, cultural, contextual, and conceptual factors that cumulatively determine a society's distinct visual identity (Bright & Bakewell, 2022). According to the researcher, in spite of the increased utilisation of AI technology in design work, designers and artists now encounter challenges in embracing these technologies without compromising traditional artworks' cultural identity. Even though AI brings innovative prospects for aesthetic production in the modern era, it has the likelihood of deforming and restructuring heritage and symbolic representations that symbolise society's identity. Following this trajectory of technological innovation in design artwork, research that explores the use of AI and its contribution to decorative artwork and the possibility of providing added value without compromising traditional aesthetic standards is urgently required. Therefore, the current study bridged the gap by critically examining the use of the AI programme Dream and its impact on students of Art Education in creating innovative decorative units that balance authenticity and innovativeness with maintaining cultural and aesthetic factors. The research seeks to answer the primary question: What is the impact of employing the AI application Dream on Art Education students' ability to design innovative decorative units?

Furthermore, the research delves into the way in which Dream AI Relevance and Design Skills Proficiency influence students' ability to design innovative decorative units, utilising Structural Equation Modelling (SEM) to conduct in-depth investigation. This approach not only examines the direct effects of AI relevance and design skills but also investigates the potential moderating role of Creative Self-Efficacy in enhancing these effects. To the authors' knowledge, no prior studies have addressed the influence of Dream AI Relevance and Design Skills Proficiency on designing innovative decorative units among art students, highlighting a significant gap in the literature. This research further contributes by introducing the moderating effect of Creative Self-Efficacy, offering novel insights into this underexplored area.

Research Hypotheses

H1: There are no differences of statistical significance at the level ($\alpha = 0.05$) between the control and experimental groups in the competencies of designing innovative decorative units for the subject of Arabic calligraphy and decoration by using the artificial intelligence program Dream among students of the Art Education Department.
H2: There are no statistically significant alterations at the significance level ($\alpha = 0.05$) for the skills of designing innovative decorative units for Arabic calligraphy and decoration when employing the artificial intelligence application Dream between the pre-and post-sizes attributed to the tentative group.

Additionally, for the second sample analysis, the study has proposed the following hypotheses to be tested at later stage.

H3: Dream Artificial Intelligence Relevance positively impacts the ability of Art Education students to design innovative decorative units.
H4: Design Skills Proficiency positively influences the ability of Art Education students to design innovative decorative units.
H5: Creative Self-Efficacy positively affects the ability of Art Education students to design innovative decorative units.
H6: Creative Self-Efficacy moderates the relationship between Dream Artificial Intelligence Relevance and the ability to design innovative decorative units, strengthening this relationship.
H7: Creative Self-Efficacy moderates the relationship between Design Skills Proficiency and the ability to design innovative decorative units, strengthening this relationship.

Literature Review

Conceptual Understanding

AI has been conceptualised in various ways within academic literature. For instance, Stahl (2021) defines AI as a collection of technologies that integrate data, algorithms, and computing power. Similarly, Hassani et al. (2020) characterize AI as a computer program that mimics human thought through the application of information from various sources to determine and learn from patterns. These characterizations reiterate the capacity of AI to process information, learn from data, and mimic the functions of the human mind during decision-making. An application of AI built by Canadian startup Wombo is a case in point. Entitled Dream, the app provides users with the capacity to create artistic images rapidly and in a preferred style of art through easy steps. Found on iOS, Android, and web platforms, Dream provides users with ease of interaction and stands out because of its capacity to turn images into digital artworks with the use of AI technology. It helps users transform their ideas into high-quality visual presentations with efficiency (Bernašek Petrinec et al., 2024).

Decorative art can be described as those artistic disciplines which is aimed at creating and shaping objects that are functional and also pleasing in nature. It encompasses crafts of furniture, glassware, ceramics, woodwork, metalwork and textiles. Historically, decorative arts have been distinguished from fine arts, such as painting and sculpture, due to their utilitarian purpose. However, this distinction is not universally applicable across cultures. For example, in many non-Western societies, fine and decorative arts are equally valued without clear separation. The appreciation and classification of decorative arts have evolved over time, reflecting shifts in societal values and cultural perspectives (López-Bertran, 2018). The researcher describes decorative art as a field that abstracts and simplifies natural forms into geometric, floral, textual, and animal-inspired decorative units, balancing artistic and functional beauty.

Past Studies

A study by Mazzone and Elgammal (2019) investigated how creative processes in digital paintings are influenced by AI. The researchers analysed AICAN, an AI model that was trained on a large library of paintings to create original paintings. From their research, the authors concluding that AI can allow artists to invent new forms of creativity in painting by combining age-old painting techniques with contemporary digital techniques. The research indicates that AI reconfigures the concept of creativity in the digital era by presenting fresh prospects of creativity in painting. Potměšilová, Potměšil and Klugar (2023) in their scoping review compared the creativity of deaf and DHH individuals to that of typically hearing individuals. In the review of 30 studies, the authors analyzed studies concerning intrinsic creativity, creativity development tasks, and comparison research studies. From the results of the study, communication and difficulties in acquiring languages did not limit the creativity of DHH individuals. Rather, DHH individuals demonstrate unique strengths in creativity, which may be attributed to improved visual and space processing skills. The review called for accessible research settings and selective education programmes to enhance the creativity of DHH students and additional research to investigate methods of creativity and stimulating visual innovation in DHH individuals.

Wang et al. (2024) analysed the twofold role of AI-generated content (AIGC) technology in reproducing traditional furniture and innovative design in the Ming style. Adopting the use of an integrative methodology involving grounded theory, empirical research, sustainable design theory, and design practice assessment, the research revealed that AIGC technology can reproduce ancient furniture with the recent design trends in mind. This synthesis helps preserve cultural heritage and enhance sustainable decorative design practice. The research emphasized maintaining a balance between traditional thinking in the arts and contemporary technological innovation to come up with innovative inventions that honor cultural heritage. Egon, Potter and Lord (2023) mapped the development of AI-generated artworks from the experimental phase to the current age of deep learning. Adopting a descriptive research method, the research established four forms of AI artworks: generative, assistive, analytical, and hybrids. The research isolated the use of AI in all areas of the arts to include visual arts, music, literature, and the upcoming NFT industry. While the use of AI in creative work has mechanized creative processes, disrupted traditional ideas of the arts, and provided means of creating unique forms of artworks, it also poses challenges in regard to copyright, prejudice, and originality of artworks.

Elmosaad et al. (2023) evaluated household waste recycling and segregation habits of Al Ahsa and other families in Saudi Arabia's Eastern Region. In a cross-sectional study, 279 household heads were surveyed utilizing a standardized web-based questionnaire. Outcomes revealed higher education and urban dwelling to be linked to improved recycling and segregation of wastes. Educational measures to improve the environment and encourage good practice in the disposal of wastes were recommended in the study. Chen, Lin and Chien (2022) created a computer painting training model with the assistance of AI and tailored feedback to enhance colour perception and painting skills in children. Personalized feedback was delivered by the system to allow students to interact with concepts of art in a dynamic way. Testing on elementary school students proved that students working with the AI-aided model developed substantially more painting skills than those working in a conventional way. These results imply that AI-based pedagogies of art education can be highly effective in promoting children's artistic competence.

Theoretical Framework

The interaction between technological innovation and artwork has seen the use of new scientific methods to create innovative designs that depart from common practice. With the evolution of how it works, the artworks' creative content also increases and finds aesthetic value and popularity among the public space (Luce, 2018). AI, one of the main branches of computer science, is interested in designing smart systems that replicate human cognition such as thinking, reasoning, and problem-solving capabilities. One of the pioneers of AI has defined AI as "the science of making machines do things that would require intelligence if done by men (Minsky, 1968). He maintained that machines can be programmed to do such things as learn, recognize shapes, and play games of strategy, things usually associated with human thinking (Engelberger, 1989).

AI simulates human cognitive processes, such as learning, reasoning, and decision-making. Research in natural language processing, machine learning, and game playing advanced significantly in the 1970s and 1980s, leading to systems that understand and generate human language, learn from data, and play complex games. These advancements aimed to replicate human intelligence (Oliveira & Figueiredo, 2024). AI is a crucial tool in contemporary decorative arts, enabling data analysis and innovative idea generation, allowing designers to express creativity with precision. Modern digital decorative design facilitates the transformation of artistic ideas into innovative digital artworks, making it easier for designers to realise their creations. AI enhances accuracy and effectiveness, improving production quality and user experience. Integrating AI with digital design helps designers express creativity freely, develop skills, and achieve their artistic goals. Scott (1980) defines decorative design as the creative reorganisation and arrangement of elements, requiring skills in rhythm, proportion, and repetition. Decorative designs combine functional and aesthetic aspects. As part of design science, decorative design involves creating two- or three-dimensional artworks, sometimes incorporating temporal and kinetic elements, dynamically occupying space. Artists use design principles, materials, and techniques to communicate ideas or themes. For example, Wu, Fan and Sun (2021) applied code theory to Taiwan bamboo tube furniture, demonstrating how cultural symbols and design principles convey meaning and aesthetics in decorative art.

Research Methodology

First Phase

In the first phase, the nature and objectives of the present research required the adoption of a quasi-experimental approach to assess the effectiveness of employing the Dream AI application and its impact on Art Education Department students in designing innovative decorative units. The study population was limited to all students enrolled in the Arabic calligraphy and ornamentation course. A purposive sample was selected to represent the population accurately, thereby allowing for generalisation of the findings. The sample comprised 60 male and female students, as presented in Table 1, equally distributed into two groups: a control group of 30 students and an experimental group of 30 students. The experimental group was exposed to the Dream AI application, while the control group followed traditional instructional methods. The analysis was based on a quasi-experimental design involving both experimental and control groups, with pre- and post-measurements, as elaborated in the subsequent analysis.

Table 1: *Distribution of Students in the Study Sample.*

Group	Number	Ratio
Control	30	50%
Tentative	30	50%
Total	60	100%

To achieve the research objectives and address its questions for the first phase, a questionnaire was developed to examine the use of the Dream AI application and its impact on Art Education Department students in designing innovative decorative units. The construction of the questionnaire was based on a review of relevant literature and previous studies pertinent to the research topic. The final version of the questionnaire consisted of two main sections. The first section gathered demographic data from the participants, focusing on gender. The second section comprised 35 items aimed at assessing the skills related to designing innovative decorative units. These items were distributed across five key axes: innovation skills in decorative design, creative thinking skills in design, artistic and aesthetic appreciation of decorative design, skills in preserving cultural and heritage identity, and precision and aesthetics in producing decorative units.

Second Phase

The second phase employed research methodology in which a structured questionnaire was administered to measure the effects of DAIR (Digital Art Integration Readiness), CSEF (Creative Self-Efficacy), and DSPR (Design Skills and Practice Readiness) towards DIDU (Digital Innovation in Design Use) among students of Arabic calligraphy and decoration in the field of Art Education. Before distribution, the questionnaire was created (Appendix A) and organized in sections that include students' demographic profiles. 350 questionnaires were distributed, and 314 responses were collected. Excluding incomplete and invalid responses, the valid sample was 307 participants. Five-point Likert scale was used in the questionnaire that is routinely employed in studies in academia. Smart PLS was employed in analysing the data in two principal steps. Firstly, the measurement model was tested in order to determine its reliability and validity. Secondly, Structural Equation Modelling (SEM) in accordance with Kasemsap’s model was utilised to investigate direct relationships and the role of CSEF in the relationships between DAIR and DIDU and between DSPR and DIDU. This method provided a detailed assessment of the proposed model conceptually.

Results and Discussion

First Phase

Study Design

The analysis was conducted following a quasi-experimental design that included both experimental and control groups, utilising pre- and post-measurements to assess the impact of the intervention. As illustrated in Table 2, this design enabled a comparative evaluation of students' performance before and after exposure to the Dream artificial intelligence application, thereby measuring its effectiveness in enhancing the ability to design innovative decorative units. Moreover, to ensure the equivalence of the experimental and control groups in designing innovative decorative units before using the Dream AI application, an independent samples t-test was conducted which is well covered in Table 3. This test assessed the significance and direction of differences between the two groups in the pre-measurement of design skills, both in total scores and across dimensions.

Table 2: *Tentative Design of the Research.*

Pre-Tool Application	Groups	Tentative Treatment Material	Post-Tool Application
Creative Decorative Unit Design Skills	Control (1)	Traditional Style	Creative Decorative Unit Design Skills
	Tentative (2)	Employing AI Dream Application	

Table 3 indicates no statistically significant differences at the level of ($\alpha \leq 0.05$) in the pre-application phase between the experimental and control groups regarding the skills of designing innovative decorative units, both overall and across all dimensions. The significance levels of the t-test for the total score and each dimension exceeded ($\alpha = 0.05$), indicating no statistical significance at the ($\alpha \leq 0.05$) level. This confirms the equivalence of the experimental and control groups in the dimensions of designing innovative decorative units among Art Education students during the pre-test.

Table 3: *Results of the Independent Samples T-Test to Examine the Equivalence of the Groups in the Pre-Test.*

Parameter	Group	Number	Arithmetic Mean	Standard Deviation	T-test Value	Statistical Significance
Skill of Innovation in Decorative Design	Control	30	2.33	0.33	0.942	0.350
	Tentative	30	2.41	0.37		
Skill of Creative Thinking in Design	Control	30	2.28	0.35	0.750	0.456
	Tentative	30	2.34	0.29		
Artistic and Aesthetic Appreciation of Decorative Design	Control	30	2.27	0.26	1.662	0.102
	Tentative	30	2.37	0.18		
Skill of Preserving Cultural and Heritage Identity	Control	30	2.24	0.35	1.148	0.256
	Tentative	30	2.33	0.26		
Accuracy and Aesthetics in Producing Decorative Units	Control	30	2.35	0.27	0.794	0.431
	Tentative	30	2.41	0.29		
Skills of Designing Innovative Decorative Units as a Whole	Control	30	2.30	0.18	1.855	0.069
	Tentative	30	2.37	0.14		

Note: The given parameters are well used in the questionnaire of first phase.

Presentation and Discussion of the Result of the First Hypothesis

The results in Table 4 reveal significant differences in the mean scores of Art Education Department students across all skills related to designing innovative decorative units between the control and experimental groups. These differences favoured the experimental group, which utilised the "Dream" artificial intelligence application in the design process. The statistical significance of these differences is confirmed by the t-test, with all values below the significance level (0.05). Moreover, the Eta Square values (η^2) reveal a large effect size of (0.870–0.963) showing the significant influence of the "Dream" application on improving design capabilities. This is also evidenced by the mean scores where the experimental group attained means of (3.65–3.76) compared to the means of (2.36–2.54) from the control group. This resulting effect is due to the capacity of AI applications to enhance creativity and design effectiveness that allows students to concentrate on in-depth design thinking and thus enhance the quality of their designs.

Table 4: *Results of the Independent Sam ples Test to Assess the Differences Between the Two Groups in the Post-Test.*

Parameter	Group	Number	Arithmetic Mean	Standard Deviation	η^2	T-test Value	Statistical Significance
Skill of Innovation in Decorative Design	Control	30	2.54	0.32	0.870	-13.453	0.000
	Tentative	30	3.67	0.33			
Skill of Creative Thinking in Design	Control	30	2.50	0.35	0.870	-13.445	0.000
	Tentative	30	3.72	0.35			
Artistic and Aesthetic Appreciation of Decorative Design	Control	30	2.52	0.26	0.923	-18.328	0.000
	Tentative	30	3.73	0.26			
Skill of Preserving Cultural and Heritage Identity	Control	30	2.42	0.40	0.878	-13.951	0.000
	Tentative	30	3.76	0.35			
Accuracy and Aesthetics in Producing Decorative Units	Control	30	2.36	0.25	0.930	-19.211	0.000
	Tentative	30	3.65	0.27			
Skills of Designing Innovative Decorative Units as a Whole	Control	30	2.47	0.17	0.963	-27.236	0.000
	Tentative	30	3.70	0.18			

Note: The given parameters are well used in the questionnaire of first phase.

Presentation and Discussion of the Result of the Second Hypothesis

Table 5 presents results indicating statistically significant differences in the mean scores of Art Education Department students across all skills related to designing innovative decorative units between the pre- and post-measurements. These differences favoured the post-measurement, demonstrating the positive impact of employing the Dream artificial intelligence application in the design process. The significance levels of the t-test confirm that these differences are statistically significant, as all values were less than (0.05). Furthermore, the Eta squared (**η**^{2}) values reflect a strong effect of the Dream application, ranging between (0.491–0.890), indicating a substantial influence on enhancing the design skills of the experimental group. This impact is further supported by the mean scores, where the post-measurement means ranged from (3.65–3.76), compared to pre-measurement means that ranged from (2.33–2.41). This marked improvement can be attributed to the capabilities of the artificial intelligence application in fostering creativity and improving design efficiency. The application enabled students to explore innovative ideas, execute more complex and precise designs, save time, and enhance the overall learning experience—factors that collectively contributed to the development of their design skills.

Table 5*: T-Test for Two Related Samples for the Skills of Designing Innovative Decorative Units Between the Pre- and Post-Measurements of the Tentative Group.*

Parameter	Group	Number	Arithmetic Mean	Standard Deviation	η^2	T-test Value	Statistical Significance
Skill of Innovation in Decorative Design	Pre-test	30	2.41	0.37	0.890	-10.651	0.000
	Post-test	30	3.67	0.33			
Skill of Creative Thinking in Design	Pre-test	30	2.34	0.29	0.721	-13.038	0.000
	Post-test	30	3.72	0.35			
Artistic and Aesthetic Appreciation of Decorative Design	Pre-test	30	2.37	0.18	0.491	-20.322	0.000
	Post-test	30	3.73	0.26			
Skill of Preserving Cultural and Heritage Identity	Pre-test	30	2.33	0.26	0.595	-15.473	0.000
	Post-test	30	3.76	0.35			
Accuracy and Aesthetics in Producing Decorative Units	Pre-test	30	2.41	0.29	0.653	-14.058	0.000
	Post-test	30	3.65	0.27			
Skills of Designing Innovative Decorative Units as a Whole	Pre-test	30	2.37	0.14	0.840	-24.624	0.000
	Post-test	30	3.70	0.18			

Note: The given parameters are well used in the questionnaire of first phase.

Second Phase

Validity and Outer Loadings

The model presented in Figure 1 illustrates the role of DAIR and DSPR as independent variables directly influencing DIDU, with CSEF as a key moderator. The item loadings are acceptable, where DAIR items (DIAR2 to DAIR5) range from 0.859 to 0.801, and DSPR items (DSPR1 to DSPR5) range from 0.723 to 0.536 (though lower, still acceptable). For DIDU, the third item was removed due to a low loading, while other items were retained, showing strong loadings. CSEF initially had five items, but item five was deleted for a low factor loading of 0.340, which affected reliability and validity. The remaining items showed no loading issues. These loadings are detailed in Table 6, where the first part presents reliability and validity results. Reliability measures include Cronbach's alpha and composite reliability, while validity is assessed through Average Variance Extracted (AVE). CSEF shows an alpha of 0.882, composite reliability of 0.924 and 0.918, and AVE of 0.738, exceeding the 0.50 threshold. DIDU demonstrates strong internal consistency with an alpha of 0.866, rho_a of 0.871, rho_c of 0.918, and AVE of 0.789, indicating robust convergent validity. DSPR also reflects good internal consistency with an alpha of 0.839, composite reliability of 0.746 and 0.862, and AVE of 0.513—above the required threshold, thus confirming its adequacy in the model.

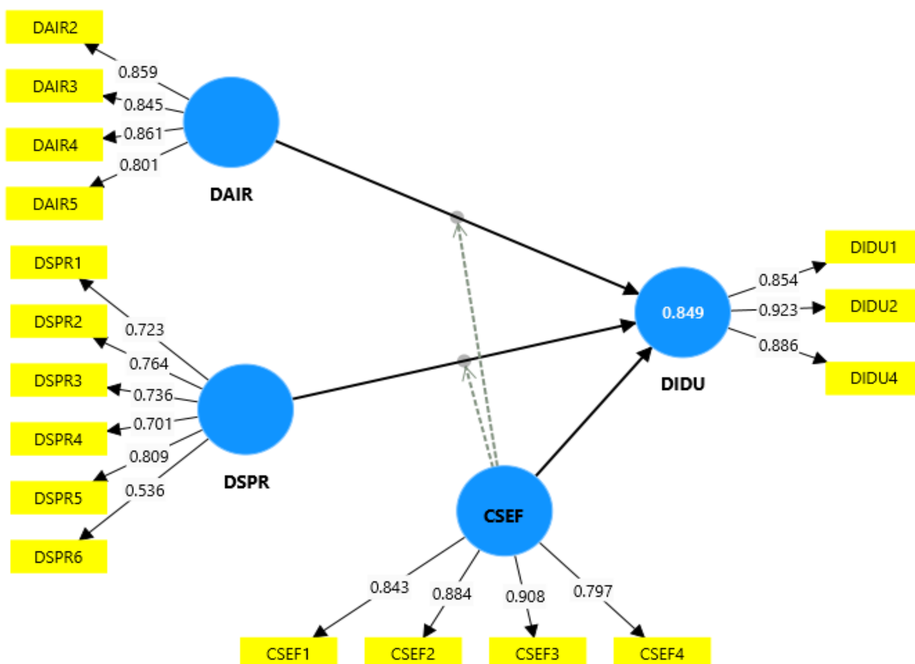

Figure 1: *Model with Loadings.*

Table 6: *Validity, Reliability and Outer Loadings.*

	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted (Raoof et al., 2021)
CSEF	0.882	0.924	0.918	0.738
DAIR	0.866	0.888	0.907	0.709
DIDU	0.866	0.871	0.918	0.789
DSPR	0.839	0.746	0.862	0.513
		Relations		**Outer Loadings**
CSEF1 <- CSEF				0.843
CSEF2 <- CSEF				0.884
CSEF3 <- CSEF				0.908
CSEF4 <- CSEF				0.797
DAIR2 <- DAIR				0.859
DAIR3 <- DAIR				0.845
DAIR4 <- DAIR				0.861

DAIR5 <- DAIR	0.801
DIDU1 <- DIDU	0.854
DIDU2 <- DIDU	0.923
DIDU4 <- DIDU	0.886
DSPR1 <- DSPR	0.723
DSPR2 <- DSPR	0.764
DSPR3 <- DSPR	0.736
DSPR4 <- DSPR	0.701
DSPR5 <- DSPR	0.809
DSPR6 <- DSPR	0.536

Discriminant Validity

The HTMT ratio is presented in Table 7 for the examined variables. The correlation between CSEF and DAIR is 0.110, between CSEF and DIDU is 0.120, and between CSEF and DSPR is 0.845. Additionally, DAIR and DIDU show a correlation of 0.123, while DAIR and DSPR correlate at 0.125. The final correlation between DIDU and DSPR is 0.0945. These results provide strong evidence supporting the discriminant validity among the variables.

Table 7: *HTMT Ratio Between the Variables.*

Variables	CSEF	DAIR	DIDU	DSPR
CSEF	-	-	-	-
DAIR	0.110	-	-	-
DIDU	0.120	0.123	-	
DSPR	0.845	0.125	0.094	-

Path Model Output

For the path model results, the individual Variance Inflation Factor (VIF) was initially tested for all selected items. Table 8 is presented VIF. The values are within the acceptable range, being less than 5, as supported by current literature (Alauddin & Nghiem, 2010; Kalnins & Praitis Hill, 2025; Zaki et al., 2023). The VIF scores for CSEF are 2.576 (CSEF1), 2.800 (CSEF2), 2.614 (CSEF3), and 1.741 (CSEF4). For DAIR, VIF scores are 3.426 (DAIR2), 1.965 (DAIR3), 2.083 (DAIR4), and 2.893 (DAIR5). The DIDU construct shows 1.818 (DIDU1), 3.163 (DIDU2), and 2.759 (DIDU4). Lastly, DSPR has VIF scores of 2.535 (DSPR1), 3.376 (DSPR2), 2.479 (DSPR3), 2.984 (DSPR4), 3.248 (DSPR5), and 1.059 (DSPR6).

Table 8: *Collinearity Diagnostic.*

Items of the Variables	VIF
CSEF1	2.576
CSEF2	2.800
CSEF3	2.614
CSEF4	1.741
DAIR2	3.426
DAIR3	1.965
DAIR4	2.083
DAIR5	2.893
DIDU1	1.818
DIDU2	3.163
DIDU4	2.759
DSPR1	2.535
DSPR2	3.376
DSPR3	2.479
DSPR4	2.984
DSPR5	3.248
DSPR6	1.059

For the direct and moderating results, a total of three direct and two moderating paths were tested. The output, presented through beta coefficients, T-statistics, and p-values, shows that DAIR significantly impacts DIDU with a beta coefficient of 0.921, the highest among all paths, as shown in Table 9. This confirms a strong and significant influence of DAIR on DIDU, supporting the first path model and affirming that DAIR significantly affects DIDU based on full sample analysis via bootstrapping in Smart PLS. This strong relationship is logical, as AI-based tools substantially enhance the creative process. When AI aligns with design needs, it provides students with practical tools, creative ideas, and design-relevant inspirations, offering a more functional approach to design. AI can automate tasks, offer creative alternatives, and simplify repetitive tasks so that students can allocate more time to creativity. Features such as templates, style advice, and instant feedback substantially enhance students' ability to create original designs. In addition to that, such support with AI increases students’ confidence and encourages them to pursue novel ideas without the risk of failure.

Moreover, the same relationship of DAIR and DIDU mirrors the extent to which relevant AI tools cover knowledge gaps and provide advice and assistance otherwise out of reach via conventional modes of learning. This is most beneficial for students of art-based education to acquire design skills. Utilization of AI tools used in creative work allows students to be exposed to current design trends and methods and to create designs that not only result from their creativity but also from practical applicability in current market expectations. Nonetheless, despite these hypothetical benefits, Table 9 provides a negative coefficient of -0.048 of the direct DAIR and DIDU relationship that is statistically not significant. Therefore, in contravention of expectations, there is no existence of a significant DAIR and DIDU relationship that was established, attesting that access to AI tools may not in itself mean innovative design improvement in exclusion of other influencing factors.

Table 9: *Direct and Moderation Analysis*.

Hypotheses	*Direct Paths*	Beta	T Statistics	P Values
H3	DAIR -> DIDU	0.921***	11.62	0.000
H4	DSPR -> DIDU	-0.048	1.345	0.179
H5	CSEF -> DIDU	0.032***	3.687	0.000
	Moderation Analysis			
H6	CSEF x DAIR -> DIDU	0.112***	5.327	0.000
H7	CSEF x DSPR -> DIDU	-0.010	0.634	0.526

The path from Creative Self-Efficacy to Designing Innovative Decorative Units is 0.032. Although small, this coefficient is statistically significant at the 1% level, confirming a meaningful influence. This suggests that Creative Self-Efficacy, reflecting students' confidence in their creative abilities, plays a role in shaping their capacity to produce innovative decorative units, particularly in calligraphy-related projects. Even a modest positive effect indicates that when students believe in their creative potential, they are more likely to generate and implement original design ideas. Though not as strong as other factors in the model, this relationship highlights the importance of fostering students' creative confidence, which can encourage them to explore new design possibilities and make better use of AI tools like Dream. Students with higher creative self-efficacy are more willing to experiment and adopt innovative approaches, making this factor crucial in enhancing design outcomes. This path is clearly shown in Table 9.

The moderation paths between both independent variables and the dependent variable, as played by Creative Self-Efficacy, have been determined. For instance, the interaction term CSEF x DAIR shows a combined effect of 0.112 with a t-statistic above 5. As the p-value is significant, this moderation path is accepted. Thus, Creative Self-Efficacy significantly moderates the relationship between DAIR and DIDU. This indicates that students with higher creative self-efficacy better utilise Dream AI in designing decorative units, especially for calligraphy. Such students are more inclined to explore and experiment with AI-generated suggestions, effectively integrating them into their creative process. Their confidence enhances their ability to produce more innovative and unique designs. Essentially, students with strong creative self-belief not only engage AI tools more effectively but also push creative boundaries. This highlights the importance of fostering creative confidence to maximise the positive impact of AI on design outcomes. This path is clearly presented in Table 9.

In the final stage of estimation, results show that similar to the direct effect of DSPR on DIDU, the moderation path is also not significant. Specifically, the path CSEF x DSPR → DIDU presents a coefficient of -

0.010, indicating a negative outcome. Moreover, due to a low T-value and a high p-value (both failing to meet the thresholds of 1.96 and 0.05), this path is insignificant. Therefore, the study rejects the presence of a significant moderating effect of CSEF on the relationship between DSPR and DIDU. The model also displays the outer model with p-values, and for the main dependent variable, DIDU, an R-square value of 0.849 is reported. This strong R-square indicates that DAIR, DSPR, and CSEF collectively explain a substantial proportion of the variance in DIDU. The model is illustrated as Figure 2.

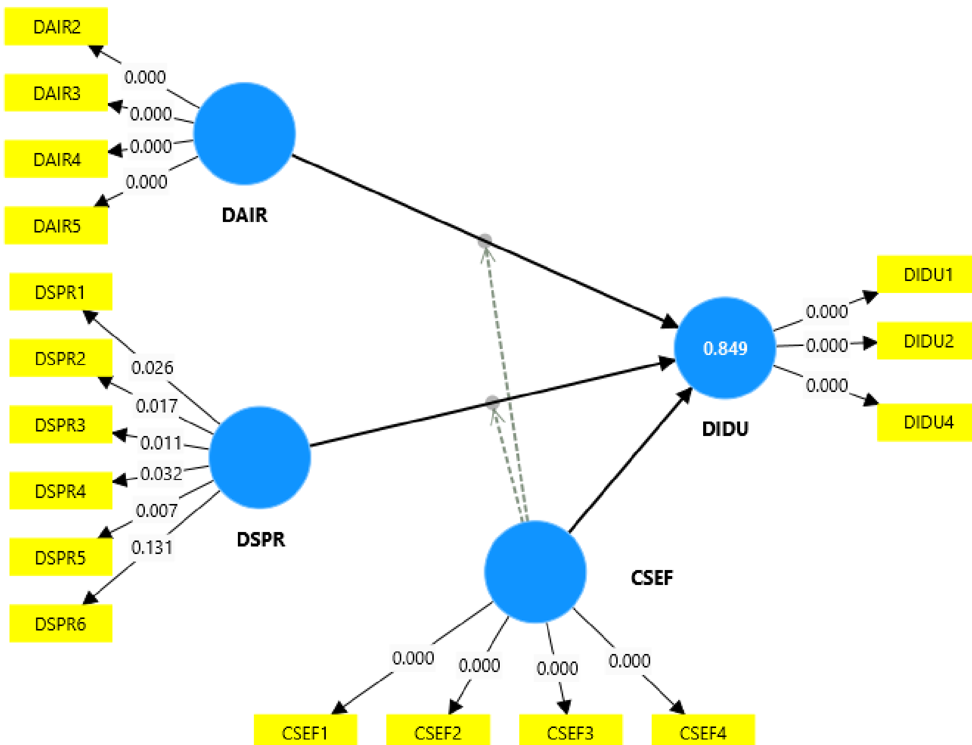

Figure 2: *P-Value for the Items and R-Square for the DIDU.*

Conclusion and Suggestions

Phase 1

This research concludes by examining the effect of using the Dream AI application on students from the Art Education Department in designing innovative decorative units within the Arabic calligraphy and decoration course. The results indicated a clear difference in the mean scores of students for all skills related to designing innovative decorative units between the control and experimental groups, with the changes favouring the experimental group that utilised the Dream AI application in the design process. The impact of utilizing the Dream application on the experimental group was considerable since the Eta Square (η^2) values of 0.870 and 0.963 signify a great influence in improving design skills. The findings also revealed significant differences in the mean of students' scores in all design skills from pre- to post-measurement with the results of the post-measurement being higher than the former. This solidifies the Dream AI application in facilitating the design process. The Eta Square (η^2) of 0.491 and 0.890 also corroborate a significant improvement in the experimental group's design skills. In light of these findings, the researcher provides the following practical recommendations:

1. Update the curriculum to include educational units focusing on the use of AI tools such as Dream, enabling students to integrate technology into their creative processes.
2. Organize training sessions to allow students to utilize the Dream program to the fullest so that their skills and creativity are developed to a great extent.
3. Regular evaluations of the effectiveness of the application in the design process should be carried out, such as the critical assessment of creative products and the scope of improvement required.
4. Conduct follow-up research to determine the long-term effects of the Dream application on student

performance to guide the improvement of effective teaching and application strategies.

Phase 2

This research has also sought to examine the role of the total Dream Artificial Intelligence Relevance and Design Skills Proficiency in influencing Art Education Students' ability to design innovative decorative units. By using the additional analysis through measurement and structural model investigation, the results are quite interesting. For example, the findings highlight a strong and significant impact of Dream Artificial Intelligence Relevance on Designing Innovative Decorative Units, with a high beta value of 0.921 and a p-value of 0.000. This outcome indicates that the use of Dream AI substantially enhances students' abilities to create innovative decorative designs. Meanwhile, CSEF also demonstrates a positive influence on DIDU. Although the coefficient is smaller, it is statistically significant, confirming that students' belief in their creative abilities contributes to innovative design creation. On the contrary, Design Skills Proficiency does not show any significant direct effect on DIDU ($\beta = -0.048$, $p = 0.179$), suggesting that merely having design skills may not lead to innovative outcomes without the support of relevant tools or technologies. Regarding the moderating effects, CSEF significantly strengthens the relationship between DAIR and DIDU ($\beta = 0.112$, $p = 0.000$), indicating that students with higher creative self-efficacy are better able to use Dream AI for innovative design. However, CSEF does not moderate the relationship between DSPR and DIDU ($\beta = -0.010$, $p = 0.526$), implying that creative confidence does not influence how design skills proficiency affects design innovation. The suggestions for this study using these results are in the following manners:

- **Making a Dream AI Part of the Classroom:** It should be among the core duties of the teachers that they use Dream AI tools in design classes to help students learn how to create new and unique decorative designs. Moreover, students should be given real-life projects for which artificial intelligence can boost their creativity and practical design skills, specifically in calligraphy.
- **Building the Students' Creative Confidence:** It is suggested that educational organisations encourage their students to believe in their creative abilities. Additionally, activities like design competitions, workshops, and showcasing successful projects would be of great assistance to help students feel more confident in using AI tools and trying out new design ideas.
- **Focusing more on Improving Design Skills:** It is equally important to offer training sessions that strengthen the design skills of students. Moreover, when students are more skilled, they can better utilise artificial intelligence technology to transform creative ideas into real, innovative designs.

References

Acharya, D. B., Kuppan, K., & Divya, B. (2025). Agentic AI: Autonomous Intelligence for Complex Goals—A Comprehensive Survey. *IEEE Access, 13*, 18912-18936. https://doi.org/10.1109/ACCESS.2025.3532853

Alauddin, M., & Nghiem, H. S. (2010). Do Instructional Attributes pose Multicollinearity Problems? An Empirical Exploration. *Economic Analysis and Policy, 40*(3), 351-361. https://doi.org/10.1016/S0313-5926(10)50034-1

Bernašek Petrinec, A., Papiga, I., Milković, K., & Plehati, S. (2024). Exploring the photorealistic capabilities of AI image generators: Stable Diffusion, DALL-E mini and dream by WOMBO. *Acta graphica: znanstveni časopis za tiskarstvo i grafičke komunikacije, 32*(2), 98-107. https://hrcak.srce.hr/320970

Bright, B. J., & Bakewell, L. (2022). *Looking High and Low: Art and Cultural Identity*. University of Arizona Press. https://uapress.arizona.edu/book/looking-high-and-low

Chen, S.-Y., Lin, P.-H., & Chien, W.-C. (2022). Children's Digital Art Ability Training System Based on Ai-assisted Learning: A Case Study of Drawing Color Perception. *Frontiers in Psychology, 13*, 823078. https://doi.org/10.3389/fpsyg.2022.823078

Egon, K., Potter, K., & Lord, M. L. (2023). AI in Art and Creativity: Exploring the Boundaries of Human-Machine Collaboration. *OSF Preprints, 20*, 1-11. https://osf.io/preprints/osf/g4nd5

Elmosaad, Y. M., Al Rajeh, A. M., Llaguno, M. B. B., Alqaimi, S. S., Alsalman, A. M., Alkishi, A. Y., et al. (2023). Self-Reported Household Waste Recycling and Segregation Practices among Families in Eastern Region of Saudi Arabia: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health, 20*(3), 1790. https://doi.org/10.3390/ijerph20031790

Engelberger, J. F. (1989). Artificial Intelligence. In J. F. Engelberger (Ed.), *Robotics in Service* (pp. 99-123).

Springer Netherlands. https://doi.org/10.1007/978-94-009-1099-7_5
Feng, L. (2025). Investigating the Effects of Artificial Intelligence-Assisted Language Learning Strategies on Cognitive Load and Learning Outcomes: A Comparative Study. *Journal of Educational Computing Research, 62*(8), 1741-1774. https://doi.org/10.1177/07356331241268349
Giannini, T., & Bowen, J. P. (2022). Museums and Digital Culture: From Reality to Digitality in the Age of COVID-19. *Heritage, 5*(1), 192-214. https://doi.org/10.3390/heritage5010011
Goldfarb, A., & Lindsay, J. R. (2021). Prediction and Judgment: Why Artificial Intelligence Increases the Importance of Humans in War. *International Security, 46*(3), 7-50. https://doi.org/10.1162/isec_a_00425
Hassani, H., Silva, E. S., Unger, S., TajMazinani, M., & Mac Feely, S. (2020). Artificial Intelligence (AI) or Intelligence Augmentation (IA): What Is the Future? *AI, 1*(2), 143-155. https://doi.org/10.3390/ai1020008
Hidayat, D. N., Restiandi, A., & Sukresna, I. M. (2025). Designing an Optimal Education and Training Model for Relationship Managers in the Digital Era. *Research Horizon, 5*(1), 79-94. https://lifescifi.com/journal/index.php/RH/article/view/450
Kalnins, A., & Praitis Hill, K. (2025). The VIF Score. What is it Good For? Absolutely Nothing. *Organizational Research Methods, 28*(1), 58-75. https://doi.org/10.1177/10944281231216381
Kasemsap, K. (2016). Promoting Leadership Development and Talent Management in Modern Organizations. In I. R. Management Association (Ed.), *Project Management: Concepts, Methodologies, Tools, and Applications* (pp. 178-205). IGI Global. https://doi.org/10.4018/978-1-5225-0196-1.ch009
López-Bertran, M. (2018). Art, Types of. In C. Smith (Ed.), *Encyclopedia of Global Archaeology* (pp. 1-7). Springer International Publishing. https://doi.org/10.1007/978-3-319-51726-1_2820-1
Luce, L. (2018). *Artificial Intelligence for Fashion: How AI is Revolutionizing the Fashion Industry*. Apress Berkeley, CA. https://doi.org/10.1007/978-1-4842-3931-5
Madahi, M. (2022). The Effects of the Applications of the Fourth Industrial Revolution-Artificial Intelligence-on the Economies of Arab Countries. *Tikrit Journal of Administrative and Economic Sciences, 18*(57 part 2), 418-437. https://doi.org/10.25130/tjaes.18.57.2.25
Mazzone, M., & Elgammal, A. (2019). Art, Creativity, and the Potential of Artificial Intelligence. *Arts, 8*(1), 26. https://doi.org/10.3390/arts8010026
Minsky, M. L. (1968). *Linear Decision and Learning Models* (AIM-156). MIT. http://hdl.handle.net/1721.1/6161
Nahavandi, D., Alizadehsani, R., Khosravi, A., & Acharya, U. R. (2022). Application of artificial intelligence in wearable devices: Opportunities and challenges. *Computer Methods and Programs in Biomedicine, 213*, 106541. https://doi.org/10.1016/j.cmpb.2021.106541
Oliveira, A. L., & Figueiredo, M. A. T. (2024). Artificial Intelligence: Historical Context and State of the Art. In H. Sousa Antunes, P. M. Freitas, A. L. Oliveira, C. Martins Pereira, E. Vaz de Sequeira, & L. Barreto Xavier (Eds.), *Multidisciplinary Perspectives on Artificial Intelligence and the Law* (pp. 3-24). Springer International Publishing. https://doi.org/10.1007/978-3-031-41264-6_1
Pimenov, D. Y., Bustillo, A., Wojciechowski, S., Sharma, V. S., Gupta, M. K., & Kuntoğlu, M. (2023). Artificial intelligence systems for tool condition monitoring in machining: analysis and critical review. *Journal of Intelligent Manufacturing, 34*(5), 2079-2121. https://doi.org/10.1007/s10845-022-01923-2
Potměšilová, P., Potměšil, M., & Klugar, M. (2023). The Difference in the Creativity of People Who Are Deaf or Hard of Hearing and Those with Typical Hearing: A Scoping Review. *Children, 10*(8), 1383. https://doi.org/10.3390/children10081383
Raoof, R., Basheer, M. F., Shabbir, J., Ghulam, H. S., & Jabeen, S. (2021). Enterprise resource planning, entrepreneurial orientation, and the performance of SMEs in a South Asian economy: The mediating role of organizational excellence. *Cogent Business & Management, 8*(1), 1973236. https://doi.org/10.1080/23311975.2021.1973236
Sachant, P., Blood, P., LeMieux, J., & Tekippe, R. (2023). *Introduction to art: Design, context, and meaning*. DigiCat. https://oer.galileo.usg.edu/arts-textbooks/3
Scott, R. G. (1980). *Foundations of Design, by: Mohamed Youssef*. Abdel Baki Ibrahim, Dar Nahdet Misr, Cairo.
Stahl, B. C. (2021). Perspectives on Artificial Intelligence. In B. C. Stahl (Ed.), *Artificial Intelligence for a Better Future: An Ecosystem Perspective on the Ethics of AI and Emerging Digital Technologies* (pp. 7-17). Springer International Publishing. https://doi.org/10.1007/978-3-030-69978-9_2
Varriale, V., Cammarano, A., Michelino, F., & Caputo, M. (2025). Critical analysis of the impact of artificial

intelligence integration with cutting-edge technologies for production systems. *Journal of Intelligent Manufacturing, 36*(1), 61-93. https://doi.org/10.1007/s10845-023-02244-8

Vieira, D. C., Paula, F. S., Yaginuma, L. E., & Fonseca, G. (2025). iMESc – an interactive machine learning app for environmental sciences. *Frontiers in Environmental Science, 13*, 1533292. https://doi.org/10.3389/fenvs.2025.1533292

Wang, Y., Xi, Y., Liu, X., & Gan, Y. (2024). Exploring the Dual Potential of Artificial Intelligence-Generated Content in the Esthetic Reproduction and Sustainable Innovative Design of Ming-Style Furniture. *Sustainability, 16*(12), 5173. https://doi.org/10.3390/su16125173

Wu, S.-H., Fan, K.-K., & Sun, C.-J. (2021). A Study on the Application of Code Theory in the Decorative Design of Taiwan Bamboo Tube Furniture. *Sustainability, 13*(7), 3722. https://doi.org/10.3390/su13073722

Zaki, A., Métwalli, A., Aly, M. H., & Badawi, W. K. (2023). 5G and Beyond: Channel Classification Enhancement Using VIF-Driven Preprocessing and Machine Learning. *Electronics, 12*(16), 3496. https://doi.org/10.3390/electronics12163496

Zhang, C., & Lu, Y. (2021). Study on artificial intelligence: The state of the art and future prospects. *Journal of Industrial Information Integration, 23*, 100224. https://doi.org/10.1016/j.jii.2021.100224

Appendix-a

Questionnaire Phase-2

Instructions

Please read each statement carefully and indicate your level of agreement using the scale below: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Section 1: *Demographic Information.*

Demographic Item	Response Options			
1. Age	Below 20	20-25	26-30	31 or above
2. Gender	Male	Female		
3. Academic Year	1st Year	2nd Year	3rd Year	4th Year
4. Experience with Artificial Intelligence	None	Basic	Intermediate	Advance
5. Frequency of Using AI in Design	Never	Rarely	Sometimes	Often

Section 2: *Dream Artificial Intelligence Relevance (DAIR).*

Statement	1	2	3	4	5
1. Dream AI provides valuable tools for designing decorative units.	0	0	0	0	0
2. The features of Dream AI align well with the requirements of my design projects.	0	0	0	0	0
3. Using Dream AI enhances my creativity in Arabic calligraphy and decoration designs.	0	0	0	0	0
4. I find Dream AI easy to integrate into my design process.	0	0	0	0	0
5. Dream AI offers innovative solutions that traditional methods cannot provide.	0	0	0	0	0
6. The relevance of Dream AI positively influences my design outcomes.	0	0	0	0	0
7. I am confident in using Dream AI to create unique decorative units.	0	0	0	0	0

Section 3: *Designing Innovative Decorative Units (DIDU).*

Statement	1 2 3 4 5
1. Using Dream AI has improved my ability to design decorative units.	0 0 0 0 0
2. I produce more creative designs with the help of Dream AI.	0 0 0 0 0
3. Dream AI contributes to generating new ideas for my decoration projects.	0 0 0 0 0
4. My designs are more innovative when I incorporate Dream AI.	0 0 0 0 0
5. Dream AI helps me create designs that meet the expectations of my instructors.	0 0 0 0 0
6. I feel more confident presenting my work when Dream AI is part of the design process.	0 0 0 0 0

Section 4: *Design Skills Proficiency (DSPR).*

Statement	1 2 3 4 5
1. I have a strong understanding of design principles and techniques.	0 0 0 0 0
2. I can effectively apply design theories to create innovative decorative units.	0 0 0 0 0
3. My design skills allow me to adapt to new design technologies, including Dream AI.	0 0 0 0 0
4. I am confident in my ability to produce creative and aesthetically pleasing designs.	0 0 0 0 0
5. I consistently achieve high-quality outcomes in my design projects.	0 0 0 0 0
6. My proficiency in design tools and software contributes to my success in design tasks.	0 0 0 0 0

Section 5: *Creative Self-Efficacy (CSEF).*

Statement	1 2 3 4 5
1. I am confident in my ability to generate creative ideas for design projects.	0 0 0 0 0
2. I believe I can solve complex design problems with innovative solutions.	0 0 0 0 0
3. I often come up with original and practical ideas during design activities.	0 0 0 0 0
4. I feel capable of producing creative outcomes even under pressure.	0 0 0 0 0
5. I am able to transform abstract concepts into creative design works effectively.	0 0 0 0 0

Thank You for Your Participation!