Assessment of Learning Effectiveness and Teaching Practice Research on Integrating Marine Conservation and Generative AI Visual Design into Plane Composition Courses for Design Students in Taiwan

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Abstract: *This study integrated marine conservation issues and generative AI visual design tools into a first-year foundational design studio unit in the Department of Visual Communication Design to develop an issue-oriented and AI-empowered teaching practice model and to evaluate its learning effectiveness. The study was conducted in a plane composition course for students at Tainan University of Technology. The instructional process included marine-themed mind mapping and composition planning, the use of generative AI to produce marine-themed plane composition works, and the subsequent transformation of these works into marine conservation materials for outreach and promotion. The research process comprised five stages: (1) course preparation, (2) course implementation, (3) learning assessment, (4) teaching material promotion, and (5) teaching practice validation. This study employed both quantitative and qualitative methods. The qualitative component adopted triangulation and interview methods to investigate the perspectives of students, teachers, and teaching practice researchers, thereby enhancing the rigor and credibility of the study in validating the teaching practice. The quantitative component measured learning effectiveness through a questionnaire encompassing four dimensions: knowledge (understanding of marine conservation), skills (ability to use generative AI tools), attitudes (attitudes toward the integration of AI into the course), and interest (learning motivation). Descriptive statistics and difference tests were used to examine and analyze these four dimensions. In addition, student self-evaluations of their works, learning process records, and work assessments were incorporated as supplementary sources of analysis. This study emphasizes university students' attention to and engagement with marine conservation issues and seeks to better understand the role of generative AI in foundational visual design instruction. It further addresses course design, work assessment, and the promotion of marine conservation while balancing creative thinking and the use of AI tools. By integrating marine conservation issues and generative AI visual design tools, and by focusing on learning effectiveness assessment and teaching implementation effectiveness, the findings of this study may serve as a reference for the integration of marine conservation sustainability issues and AI pedagogy into design education in Taiwan.*

Keywords: **Taiwan, Marine Conservation, GAI, Visual Design, Learning Effectiveness, Teaching Practice Research**

1. INTRODUCTION

Against the backdrop of sustainable development and the escalating risks facing the marine environment, enhancing public literacy in marine conservation through education and promoting understanding of marine conservation issues through design have become important concerns in recent research (Sun, Lee, & Lim, 2025). A defining feature of the Fourth Industrial Revolution is artificial intelligence (Thakkar & Panchal, 2018). Numerous scholars have explored the application of AI in visual arts education (Wang, 2025; Tseng, 2024; Lu, Wu, & Tsai, 2019), as well as its use in marine conservation education (Chang, Chang, Liu, Li, Hsiao, Hung, & Li, 2024). Generative AI has rapidly entered visual communication design curricula and professional design practice, reshaping both design

pedagogy and modes of design learning. Relevant studies have indicated that most design students believe generative AI will transform the future development of design practice, and they expect more guided and structured support in design courses (Fleischmann, 2024). Following the introduction of generative AI into design-related learning activities, the resulting changes in learning outcomes and assessment methods have also become important issues for higher education to address (Weng, Gu, Rajaram, & Chiu, 2024).

In recent years, an increasing number of studies have taken visual communication design teaching as their context. The integration of generative AI into design instruction can enhance students' cognitive, affective, and behavioral learning, and it has played a highly innovative role in the incorporation of AI into visual communication education. In the field of visual design education, the introduction of generative AI has attracted particular attention because it enables rapid image generation, assists conceptual development and marine-themed mind-map-based composition planning, improves the efficiency of visual design production, and changes design students' ways of thinking and creative behavior (Yusuf, Pervin, & Román-González, 2024). According to Li, Sun, and Kim (2025), when generative AI is appropriately integrated into visual communication design courses, it not only helps enhance classroom participation and learning interaction, but also improves students' understanding of the integrated application of technology and design. However, the use of AI in design learning may also give rise to issues such as the commodification of creativity and the need to redefine the criteria for teacher assessment. Therefore, its educational application must be grounded in careful curriculum design and clearly defined instructional objectives (Li, Sun, & Kim, 2025).

Generative AI systems in design learning contexts, which combine a two-stage process of conversational generation and image generation, have been shown to provide substantial benefits for students' creative performance and the quality of their work (Abrusci, Dabaghi, D'Urso, & Sciarrone, 2025). This study was conducted in a plane composition course in the Department of Visual Communication Design at Tainan University of Technology. It integrates a marine conservation visual creation unit with marine conservation works and generative AI visual design tools as part of an AI-oriented teaching practice study, and further evaluates its learning effectiveness. This study places emphasis on students' understanding of marine conservation, their ability to use generative AI tools, and their attitudes toward integrating AI into the curriculum. It also comprehensively examines the educational value of this instructional model through student self-evaluations of their works, learning process records, work assessment, expert interviews, and triangulation. It is hoped that this study will help clarify the role of generative AI in foundational visual design instruction and serve as an important reference for integrating marine conservation sustainability issues and AI pedagogy into design education in Taiwan, thereby further advancing research on learning effectiveness assessment and teaching practice in visual communication design.

2. RESEARCH DESIGN

2.1 Research Method

This study aims to investigate the effects of integrating marine conservation works and generative AI visual design tools into a plane composition course for first-year students in the Department of Visual Communication Design at Tainan University of Technology in

Taiwan, and further to examine the feasibility and educational value of such a teaching practice. This study adopted a mixed methods approach, combining quantitative and qualitative research in order to enhance the completeness, rigor, and interpretive strength of the findings. The quantitative component was primarily used to evaluate changes in students' learning effectiveness after the course intervention, whereas the qualitative component was employed to explore students' learning processes, teachers' instructional reflections, and the pedagogical implications of integrating marine conservation issues into a visual design course.

2.2 Research Participants and Research Setting

With regard to the research setting, this study was conducted in a plane composition course taken by first-year students in the Department of Visual Communication Design at Tainan University of Technology, and the creative unit within the plane composition course served as the core of this teaching practice study. The course design integrated marine conservation issues with generative AI visual design tools and sequentially guided students through marine-themed mind mapping and composition planning, the use of generative AI to generate marine-themed plane composition works, and the further transformation of these works into instructional design materials with marine conservation significance, in order to achieve multiple instructional objectives, including issue comprehension, creative expression, and the promotion of teaching materials.

2.3 Research Procedure

The research procedure of this study consisted of five stages, including the course preparation stage, course implementation stage, learning assessment stage, teaching material promotion stage, and teaching practice validation stage, thereby ensuring that both the arrangement of the instructional process and the verification of learning outcomes were taken into account (as shown in Figure 1). These stages are briefly described as follows:

(1) Course Preparation Stage:

This stage mainly involved course planning and preliminary preparation, including the organization of marine conservation works, the selection of generative AI tools, the design of instructional activities, and the development of questionnaires, worksheets, and work assessment criteria, which served as the foundation for subsequent course implementation.

(2) Course Implementation Stage:

At this stage, marine conservation issues and generative AI visual design were formally integrated into the foundational course instruction. Students were guided to begin with marine-themed mind mapping and then to use AI tools to create marine-themed design works, thereby completing the design practice process.

(3) Learning Assessment Stage:

This stage examined students' learning effectiveness in terms of knowledge, skills, attitudes, and interest through questionnaires, student works, self-evaluation forms, and learning process records, which served as the basis for analyzing instructional outcomes.

(4) Teaching Material Promotion Stage:

At this stage, the marine-themed design works completed by students were transformed into marine conservation promotional teaching materials. This promotion was carried out

in conjunction with the marine conservation program of the Ocean Conservation Administration of the Ocean Affairs Council in Taiwan. Through exhibition, sharing, or instructional application, the course outcomes were extended and the educational value and dissemination function of the works were enhanced.

(5) Teaching Practice Validation Stage:

At this stage, both quantitative and qualitative data were comprehensively analyzed, and triangulation was employed to examine the instructional implementation process and students' learning performance, in order to evaluate the feasibility, effectiveness, and educational significance of the teaching model developed in this study. This stage also included students' learning feedback and teachers' instructional reflections.

Figure 1. The research process of this study consisted of five stages (Source: This study, 2026)

In the qualitative component of this study, triangulation and semi-structured interviews were employed for data collection and analysis. The investigation focused on three aspects—students, teachers, and the integration of marine issues into visual design courses—in order to gain an in-depth understanding of the teaching practice process. This study adopted triangulation to enhance the credibility and interpretive strength of the findings through cross-validation using multiple data sources and multiple methods of data collection. The concept of triangulation lies in verifying the same phenomenon through different types of data or methods so as to establish a consistent or complementary chain of evidence (Wang & Liu, 2025). The triangulation dimensions of this study (as shown in Figure 2) included the following:

(1) Student perspective:

Assessment questionnaires completed by first-year students at Tainan University of Technology, self-evaluation forms for student works, and learning process records, including marine-themed sketches, AI-generated marine images, and marine conservation creative works.

(2) Teacher perspective:

Teachers' instructional reflections, teaching interviews, and classroom observations at Tainan University of Technology, as well as classroom observation records, instructional video records, teaching feedback, scoring results based on assessment criteria and lectures, were used to examine students' learning performance and learning effectiveness.

(3) Researcher perspective:

The discussion was centered on teaching practice research, with a student-centered orientation aimed at enhancing students' learning effectiveness, strengthening teachers' professional teaching competence, and thereby improving instructional quality and students' competitiveness.

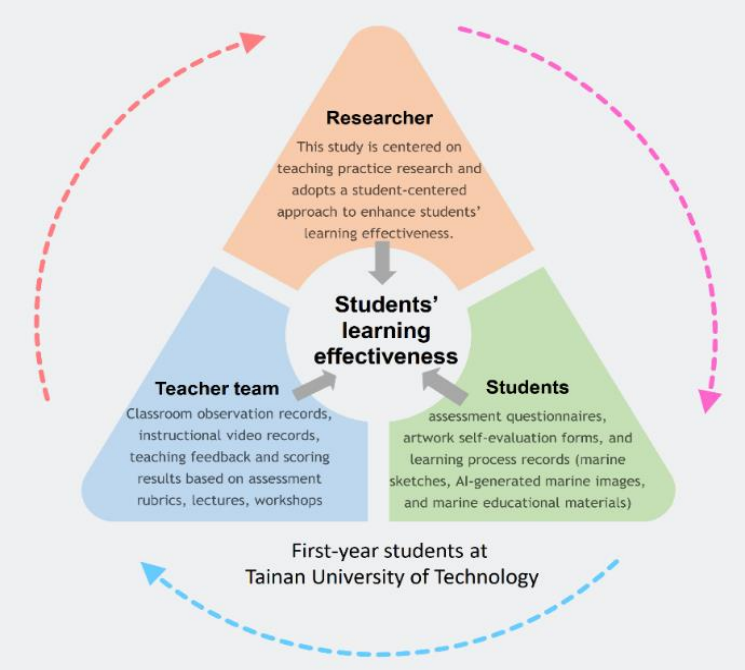


Figure 2. Triangulation Framework of This Study for Teaching Practice Research (Source: This study, 2026)

In the quantitative component of this study, a questionnaire survey was used as the primary data collection instrument to assess students' learning effectiveness. The questionnaire covered the assessment of learning effectiveness (as shown in Figure 3) and was structured around four dimensions. The data obtained were analyzed using descriptive statistics and difference tests in order to understand the performance of each dimension and their interrelationships, thereby serving as the basis for evaluating the effectiveness of the course implementation. The learning effectiveness assessment for the integration of marine conservation and generative AI into visual design included the following four dimensions:

(1) Knowledge dimension: students' understanding of marine conservation knowledge.

(2) Skill dimension: students' ability to use generative AI tools.

(3) Attitude dimension: students' positive perceptions of the integration of generative AI into the design course.

(4) Interest dimension: whether the integration of generative AI into design works can enhance students' learning interest.

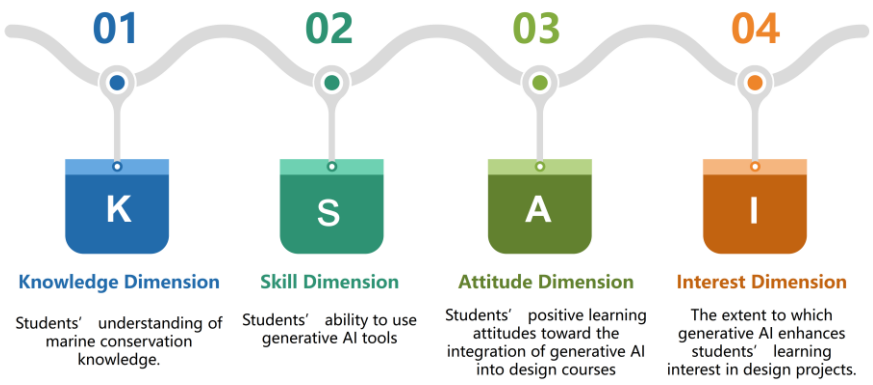


Figure 3. The Four Dimensions of Learning Effectiveness Assessment for the Integration of Generative AI into Marine Conservation Visual Design

(Source: This study, 2026)

In addition to the research procedure described above, this study also incorporated interview data and collected students' self-evaluations of their works, learning process records, work assessment criteria, and teachers' classroom observations for multiple cross-checking and comparison, thereby enhancing the credibility of the study. Through the integrated analysis of quantitative and qualitative data, this study not only evaluated the learning effectiveness of students in the Department of Visual Communication Design in a course integrating marine conservation and AI visual design, but also further explored the influence of this teaching model on plane composition design education. Centered on teaching practice research, this study integrated marine conservation issues and generative AI visual design tools, and conducted an empirical examination with a focus on learning effectiveness assessment and teaching implementation effectiveness.

3. TEACHING PRACTICE IN MARINE3. CONSERVATION AND GENERATIVE AI DESIGN

3.1 Mind Map Association Teaching of Integrating Marine Conservation into Generative AI Design on

The teaching implementation of this study was conducted in a plane composition course for first-year students in the Department of Visual Communication Design at Tainan University of Technology. It integrated marine conservation issues and generative AI visual design tools, and further introduced AI-collaborative visual design learning activities. The overall instructional implementation emphasized a foundation in basic design training. Through the processes of introducing marine conservation themes, generating creative ideas through marine-themed mind mapping, AI-assisted generation, work transformation, and the dissemination of outcomes, students were guided to enhance their knowledge of marine conservation while also improving their ability to apply generative AI tools, their design performance, and their learning engagement.

During the course preparation stage, the researcher first collected marine conservation-related teaching materials and case examples, organized content suitable for integration into the plane composition course, and selected appropriate generative AI visual design tools based on the course objectives to serve as creative support media for students. In the first

stage of AI collaboration, the focus was on creative ideation for marine conservation works, with particular emphasis on associative mind mapping. Based on the creative associations generated through the marine-themed mind maps, students then initiated preliminary design sketches. Figure 4 shows students' marine-themed mind map exercises completed in class. At the center of each mind map was the word "Marine," which served as the starting point for visual design ideation.

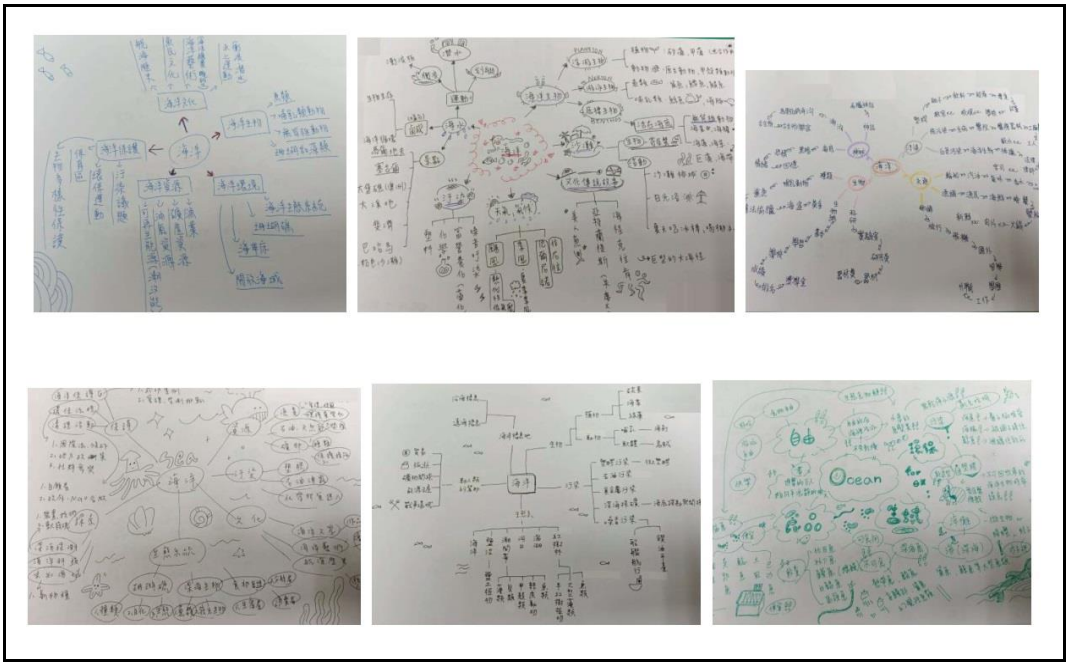


Figure 4. Mind Map Exercises Integrating Marine Conservation and Generative AI (Source: This study, 2026; Drawn by students in class)

3.2 Sample Classroom Works on Integrating Marine Conservation into Generative AI Visual Design

To provide a concrete illustration of how this study integrated marine conservation issues into a plane composition course in conjunction with generative AI visual design tools, cetaceans, a representative class of protected marine species, were used as a classroom creative example. This example demonstrates how students employed prompt input to generate and compare marine-themed visual works across different generative AI platforms. Cetaceans are among the most iconic species in marine conservation and carry clear implications for marine environmental education. They are therefore well suited as a topic for issue-oriented creative work in visual communication design courses. By guiding students to use cetaceans as their design subject, this study aimed not only to enhance their understanding of marine conservation issues, but also to enable them to express conservation awareness through image design and further transform their design works into visual teaching materials with educational and outreach functions.

In this classroom example, the instructor first provided a unified prompt as a common basis for comparing images generated by different AI tools. This arrangement was intended to align with the core requirements of the plane composition course, including composition

and visual layout, so that students could observe differences in how various AI platforms interpreted the same textual instruction and generated corresponding visual outputs. The AI tools used in this course were not restricted to a single platform. The generative AI tools most frequently used by students included Chat GPT, Gemini, Copilot, Dee Vid AI, DALL-E, Adobe Firefly, and Leonardo. Each tool demonstrated distinctive features in terms of image generation logic, stylistic interpretation, compositional performance, color arrangement, and geometric representation. Some AI tools were particularly effective in generating clear contours and compositions, making them suitable for compositional analysis in a plane composition course. Others emphasized artistic stylization and visual effects, thereby enhancing the attractiveness of the generated images. Accordingly, different AI tools were all able to meet the instructional objectives required.

The classroom activities in this study not only guided students in the technical use of generative AI tools, but also cultivated their abilities in image evaluation, stylistic judgment, communication effectiveness, and tool selection from the perspective of design education. When comparing cetacean works generated by different AI platforms, students were required to consider multiple aspects, including marine conservation themes, cetacean contours, geometric compositional expression, aesthetic quality in plane design, and the potential of the works for marine conservation educational promotion. Through this process, students came to understand that generative AI is not merely an automatic image-generation tool, but rather a tool that requires creative thinking and critical selection. In this classroom example, the course TA (Teaching Assistant) first produced trial AI-generated sample works (Figure 5). The integration of marine conservation issues with generative AI visual design not only enhanced students' understanding of marine ecological conservation, but also contributed to the development of their creative ideation, visual design ability, plane composition ability, and tool application skills within the course.

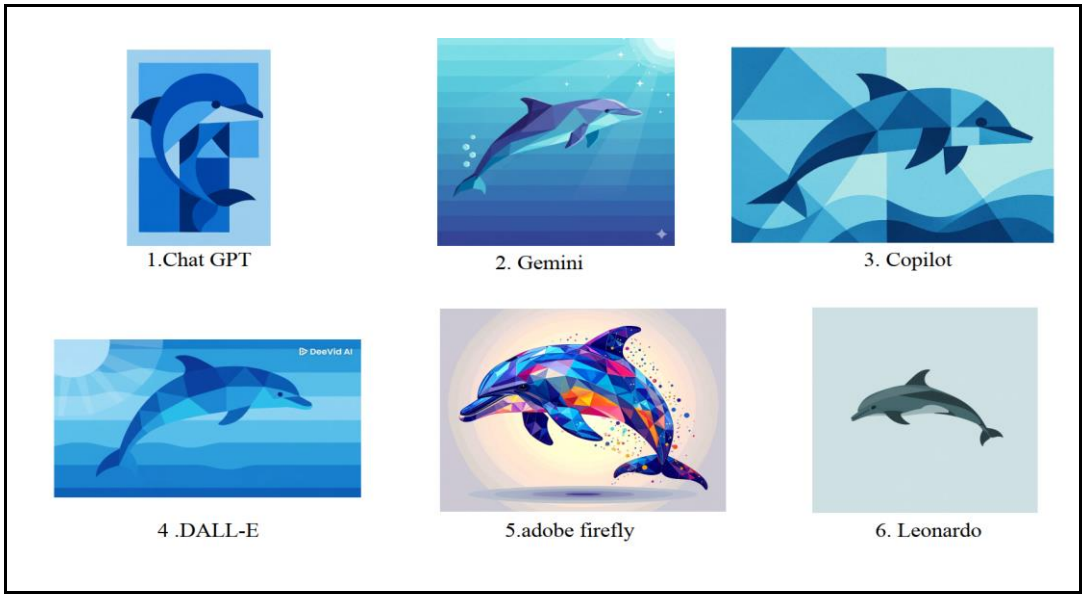


Figure 4. Mind Map Exercises Integrating Marine Conservation Issues and Generative AI Visual Design

(Source: This study, 2026; Generated by the course TA, Yan-Qing Chen)

The classroom activities in this study not only guided students in the technical use of generative AI tools, but also cultivated their abilities in image evaluation, stylistic judgment, communication effective.

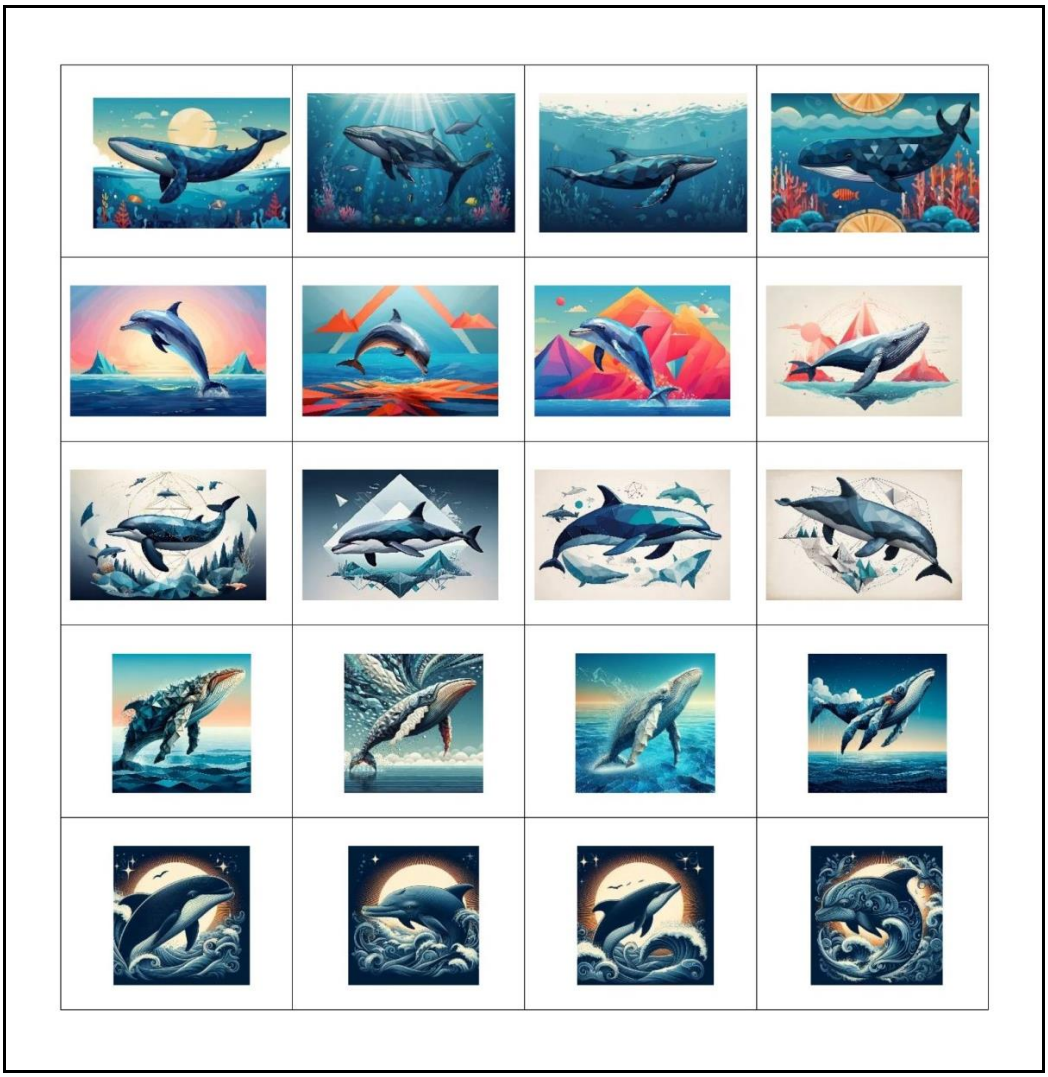


Figure 6. Works Integrating Marine Conservation and Generative AI Visual Design (Cetacean Exercises)

(Source: Compiled by this study, 2026; AI-generated by students enrolled in the Department of Visual Communication Design at Tainan University of Technology, Taiwan)

Figure 7 presents the instructional setting of this study, showing students' hands-on participation in an AI course in the computer classroom of the Library and Information Building at Tainan University of Technology. During the course implementation process, students used computer equipment to operate generative AI visual design tools and engaged in a series of learning activities related to marine conservation themes, including creative ideation, image generation, visual adjustment, and work production. Under the guidance and explanation of the instructor, students gradually completed the learning process from understanding the theme, associating ideas through marine-themed mind mapping, entering

prompts, and generating AI images, to subsequent work revision and the integration of visual expression. The teaching setting not only demonstrates the concrete situation of students carrying out design creation in a digital environment, but also reflects the implementation process of integrating marine conservation, generative AI visual design tools, and the plane composition course in this study. As shown in the photographs in Figure 7, the actual hands-on operation and interactive learning in the classroom enabled students, under the teacher's guidance, to simultaneously enhance their understanding of marine conservation and their ability to apply AI tools to visual design expression, thereby further presenting the concrete outcomes and practical value of the teaching model developed in this study.

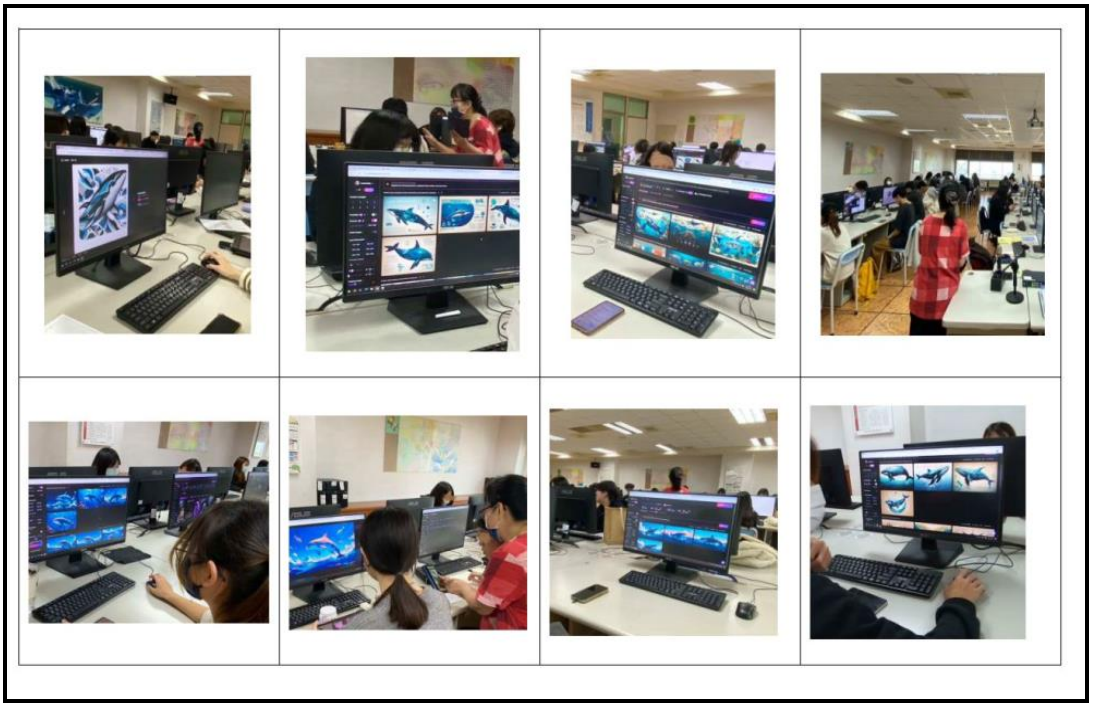


Figure 7. Instructional Setting of This Study: Students Attending Class in Computer Classroom L703 of the Library and Information Building at Tainan University of Technology in Taiwan

(Source: Compiled by this study, 2026; photographed by the TA)

4. LEARNING EFFECTIVENESS ASSESSMENT AND DISCUSSION

4.1 Students' Learning Effectiveness Assessment

This study was conducted in the Plane Composition course in the Department of Visual Communication Design at Tainan University of Technology in Taiwan, where marine conservation teaching materials and generative AI visual design were integrated into the instruction, and the enrolled students were taken as the research participants for learning effectiveness assessment. The participants consisted of two first-year classes, with a small number of upper-year students taking the course as electives. A total of 105 questionnaires were distributed, including 54 students from Class A and 51 students from Class B; among

them, 22 were male and 73 were female, with a small number of upper-year elective students also included. The questionnaire employed a Likert scale and assessed students' learning effectiveness across four dimensions: knowledge, skills, attitudes, and interest. The overall results showed that the mean scores of all four dimensions were above 4.00, indicating students' positive evaluations of the course design and learning process, and demonstrating that the integration of marine conservation issues with generative AI visual design produced favorable teaching practice outcomes for design students.

Among the four dimensions, the interest dimension had the highest mean score (M = 4.83, SD = 0.703), indicating that students showed a high level of learning interest in the integration of generative AI into a marine conservation visual design course. This result suggests that combining traditional Plane Composition instruction with generative AI tools and marine conservation issues can better stimulate students' motivation to participate and enhance their engagement in design creation. The skill dimension had a mean score of 4.75 (SD = 0.741), showing that most students perceived clear improvement in their ability to operate generative AI tools and generate image-based design works. This finding indicates that the course not only enhanced students' digital design abilities, but also helped them grasp the application of emerging technologies in visual design. The attitude dimension yielded a mean score of 4.58 (SD = 0.798), indicating that most students positively recognized the instructional value of integrating generative AI into design courses as a tool for creative ideation and design assistance. The knowledge dimension had a mean score of 4.12 (SD = 0.897). Although this was the lowest among the four dimensions, it still reflected a high level of performance, suggesting that students had developed a certain degree of understanding and improvement in marine conservation knowledge after taking the course.

Table 1. Background Information of the Six Interviewed Teachers in This Study

Assessment Dimension / Item Number	Mean	SD	Mean (Dimension)/ SD (Dimension)	Description of Dimension Content
Knowledge Dimension /A1	4.03	0.91	4.12/ 0.897	Assessing students' understanding of marine conservation knowledge
Knowledge Dimension /A2	4.18	0.88		
Knowledge Dimension /A3	4.25	0.93		
Knowledge Dimension /A4	4.02	0.87		
Skill Dimension /B1	4.62	0.75	4.75/ 0.741	Assessing students' ability to use generative AI tools
Skill Dimension /B2	4.81	0.72		
Skill Dimension/ B3	4.93	0.69		
Skill Dimension /B4	4.64	0.80		
Attitude Dimension/C1	4.41	0.83	4.58/ 0.798	Assessing students' learning attitudes toward the integration of generative AI into the design course
Attitude Dimension/C2	4.67	0.77		
Attitude Dimension/C3	4.73	0.79		
Attitude Dimension/C4	4.51	0.80		
Interest Dimension/D1	4.71	0.72	4.83/ 0.703	Assessing whether the integration of generative AI into design works can enhance students' learning interest
Interest Dimension/D2	4.89	0.68		
Interest Dimension/D3	4.96	0.66		
Interest Dimension/D4	4.76	0.75		

(Source: This study, 2026)

4.2 Qualitative Interview Results and Discussion

This study adopted a qualitative research approach to conduct an in-depth investigation of the teaching practice involving the integration of marine conservation issues and generative AI visual design. Six teachers with professional backgrounds in design and teaching experience were invited to participate in the interviews as the primary interviewees of this study (as shown in Table 2). The expertise of the interviewed teachers covered illustration, multimedia design, painting, photography, graphic design, visual communication design, and generative AI. Their teaching experience ranged from 9 to 32 years, and their academic ranks included assistant professor, associate professor, and lecturer, reflecting diverse and substantial teaching and professional experience.

The qualitative interviews in this study primarily focused on understanding the interviewees' views regarding the course content design, the ways in which marine conservation issues were integrated, the application of generative AI visual design tools, and the overall appropriateness of the teaching implementation and teaching materials, in order to identify the effective factors in the instructional design of this study. In addition, this study explored the interviewed teachers' perspectives on students' use of generative AI and visual design tools in creating marine conservation-themed works during the course, particularly in terms of students' understanding of marine conservation, the quality of visual expression, the performance of creative thinking, and their engagement with marine conservation issues. These perspectives served as important evidence for the discussion of teaching practice in this study. Through the collection and analysis of interview data from teachers with different design specializations, this study examined the instructional outcomes of the course from a professional pedagogical perspective, particularly with respect to the integration of marine conservation issues, the application of generative AI tools, and student learning effectiveness.

Table 2. Background Information of the Six Interviewed Teachers in This Study

Teacher Code	Teaching Experience	Years of Teaching Experience	Academic Rank
Teacher A	Illustration, Generative AI	9 years	Assistant Professor
Teacher B	Multimedia Design, Generative AI	20 years	Associate Professor
Teacher C	Painting, Generative AI	10 years	Assistant Professor
Teacher D	Photography, Generative AI	32 years	Assistant Professor
Teacher E	Painting, Photography	26 years	Assistant Professor
Teacher F	Graphic Design, Visual Design	30 years	Lecturer

(Source: This study, 2026)

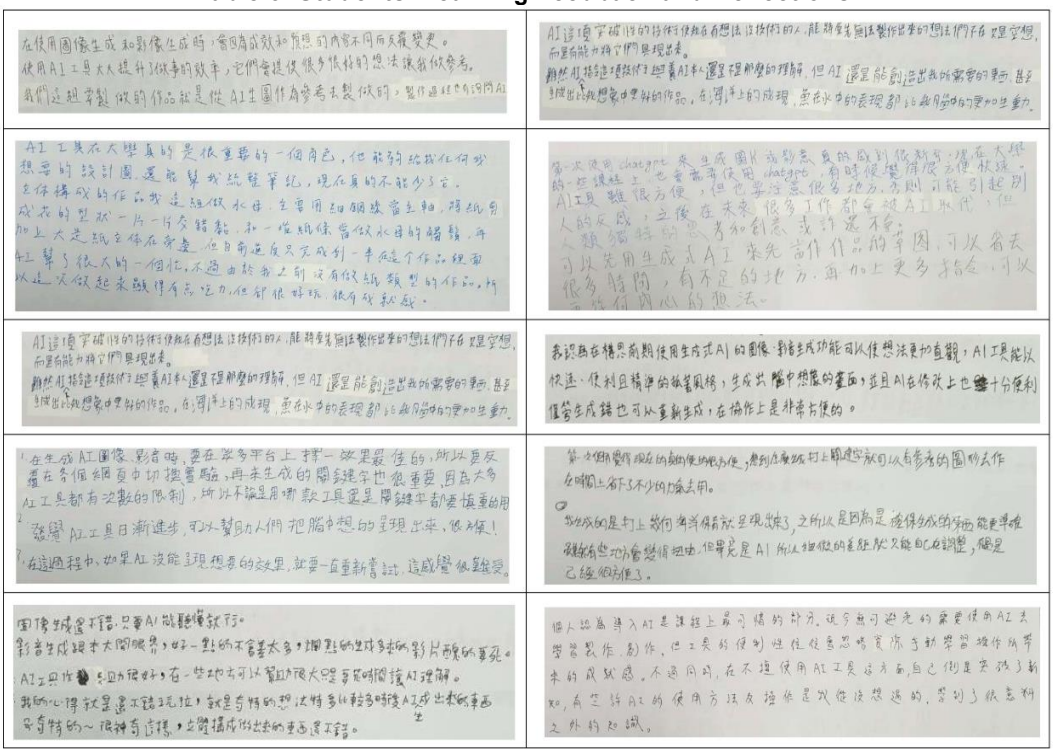
4.3 Students' Learning Feedback

Through the learning feedback provided by students in the Department of Visual Communication Design at Tainan University of Technology in Taiwan (Table 3), this study comprehensively analyzed students' learning reflections and responses. The results indicate

that most students believed that integrating marine conservation issues into the Plane Composition course, together with the use of generative AI visual design tools for creative work, enhanced their learning interest and sense of participation in the course. Students noted that this teaching approach differed from traditional Plane Composition instruction in that it encouraged them to expand their thinking beyond composition and formal expression to include marine conservation and the messages conveyed through design works, thereby strengthening the direction and purpose of their creative learning.

With regard to the application of generative AI tools, students reported that AI image generation was helpful in quickly providing creative inspiration and references for visual sketches. In developing marine-themed ideas and expressing them through plane composition, students completed image generation through repeated prompt writing and further compared the outputs of different AI tools. These tools enabled students to transform their ideas into concrete visual images more easily, which contributed to improving both the completion of their works and the diversity of their design expression. Students were no longer merely presenters of aesthetic form, but also learners of marine conservation. The course further enhanced their abilities in applying generative AI and in visual creation, thereby demonstrating the practical significance of integrating AI into the teaching of the Plane Composition course.

Table 3. Students' Learning Feedback and Reflections



(Source: Compiled by this study, 2026; Written by students in class; Photographed by TA)

4.4 Teachers' Instructional Reflections and Teaching Practice Research

From the perspective of teachers' instructional reflections, integrating marine conservation issues into the Plane Composition course helped students establish a clear thematic focus in their creative activities and enabled design learning to extend beyond

formal training toward an understanding of environmental issues and social values. The findings showed that students demonstrated a high level of interest in AI image generation and exhibited strong learning engagement and creative motivation throughout the processes of prompt writing, image comparison, work selection, and redesign. Generative AI tools indeed provided valuable support for concept development and visual reference at the early stage of the course, helping students reduce difficulties in the creative process and improve the speed of work completion. However, although AI can serve as an important supportive tool in design learning, teachers still need to guide students back to the essence of design thinking in order to avoid overreliance on the tool.

This study adopted triangulation to collect and analyze data from three perspectives: students, teachers, and the researcher. Based on the triangulated findings from these three sources, including students' learning feedback, teachers' professional observations, and the researcher's instructional reflections, the course model developed in this study was shown to be effective in promoting both learning effectiveness and instructional innovation. From the perspective of teaching practice research, this study not only focused on students' final work performance, but also emphasized students' learning transformations throughout the course process, teachers' adjustments during instruction, and the extent to which the overall instructional design responded to the needs of the teaching context. At its core, teaching practice research seeks to identify and refine problems arising in authentic teaching situations so as to enhance teachers' professional competence and improve students' learning quality. The results of this study indicate that the integration of marine conservation issues and generative AI tools also enhanced students' overall performance in design creativity, AI application, and visual communication ability.

5. Conclusion

This study focused on the Plane Composition course taken by first-year students in the Department of Visual Communication Design at Tainan University of Technology in Taiwan, with learning effectiveness assessment and teaching practice research serving as its core framework. The findings indicate that the course model developed in this study, which integrated marine conservation issues, plane composition design, the application of generative AI tools, design practice, and AI-assisted instructional features, brought new insights and meaningful implications to both student learning and teacher instruction. In terms of student learning effectiveness, the results showed that students developed a better understanding of the importance of marine conservation during the creative process. Through practice-based exercises in plane composition design and AI-generated imagery, students enhanced their abilities in concept development, visual expression, and innovative design. The integration of marine conservation issues and generative AI tools into a foundational design course was therefore found to contribute positively to the learning of students in the Department of Visual Communication Design.

This study also incorporated triangulation by collecting and analyzing data from three perspectives: students, teachers, and the researcher. The results demonstrated that the teaching model proposed in this study was effective in enhancing learning outcomes in actual teaching settings. At the same time, it encouraged teachers to reconsider the content arrangement, instructional methods, and assessment approaches of the Plane Composition course, thereby highlighting the value of teaching practice research in visual

communication design education. By integrating marine conservation issues and generative AI visual design tools into the Plane Composition course, this study demonstrates the practical value of teaching practice research in design education contexts. It further shows that teachers can enhance instructional quality and strengthen students' competitiveness through systematic instructional design, data collection, analysis, and reflection. The findings of this study may serve as a reference for integrating marine conservation sustainability issues and generative AI pedagogy into design education in Taiwan. For future research, it is recommended that the scope of participants and course types be expanded. Subsequent studies may also be extended to students at different academic levels or to other design disciplines. In addition, including Departments of Visual Communication Design from other universities for cross-institutional comparisons of courses and teaching methods would further enhance the significance of teaching practice in the integration of AI into design education.

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