A Teaching Practice Research on Integrating Generative AI and Concept Mapping into Visual Creation Courses for Design Students in Taiwan

Lan-Ting Wang

Associate Professor, Department of Visual Communication Design,

Tainan University of Technology, Taiwan

Abstract: *This teaching practice research was conducted in the compulsory course Plane Composition in the Department of Visual Communication Design at Tainan University of Technology in Taiwan, with first-year undergraduate students as the main participants. The study integrates concept mapping into image-based design analysis to support students in exploring the associative transformation between form and meaning, thereby enhancing their design creativity. At the same time, generative AI was incorporated into face-to-face studio teaching to increase students' learning interest and to alleviate anxiety during the creative process, particularly when dealing with abstract compositional principles. In this study, the Plane Composition course adopted "Four Seasons Imagery Composition" as the main thematic unit. Students developed visual creations based on the imagery of spring, summer, autumn, and winter, and employed points, lines, planes, and geometric forms as compositional elements to train their ability to transform abstract imagery into concrete visual forms. Throughout the course, qualitative data were collected from classroom discussions and reflective texts produced by both the instructor and the students regarding the design outcomes. The findings indicate that the integration of generative AI and concept mapping in the design curriculum effectively enhances students' learning outcomes, particularly in terms of image–form transformation and conceptual clarity. The results further suggest that this approach has practical value for the teaching and learning of foundational design courses and related subjects in higher education.*

Keywords: **GAI, Concept Mapping, Taiwan, Visual Communication, Teaching Practice Research**

1. INTRODUCTION

With the rapid advancement of artificial intelligence technologies, generative artificial intelligence (Generative AI, hereafter Gen AI) has increasingly moved beyond the research domain into design and creative industries, and its impact on visual creation and design education has attracted growing attention. Recent literature indicates a marked increase, from 2022 to 2025, in studies that embed Gen AI into design curricula in higher education, suggesting that Gen AI has become an emerging and influential force in the field of design education (Ng & Ho, 2025; Lin, Zhou, & Cai, 2021; Bello, 2025). In the context of traditional design education in Taiwan, one of the core pedagogical challenges in foundational courses—such as composition design and plane composition—lies in helping design students transform abstract concepts into concrete visual images. At the same time, guiding students to engage in innovative thinking and drawing processes as a basis for creative design production has become an important trend in contemporary instructional practice (Wang, 2019; Yu, 2021; Liu, 2021; Albakry, Hashim, & Puandi, 2025).

Concept mapping has been widely recognized as an effective front-end tool in design and learning processes, as it supports learners in visualizing the structure of knowledge or concepts, clarifying relationships among them, and thereby fostering meaningful learning (Bartlett & Camba, 2024; Su, Zhang, & Tang, 2025). Against this backdrop, the present teaching practice research was implemented in the compulsory course Plane Composition for first-year students in the four-year program of the Department of Visual Communication Design at Tainan University of Technology, Taiwan. The study emerged from concrete problems observed in the teaching setting and the need to address issues related to students' difficulty in concept–image transformation and limited creative thinking. The research focuses on integrating Gen AI and concept mapping into the Plane Composition course to

enhance students' visual design creativity, with the dual aim of improving teaching quality and promoting students' learning outcomes. Specifically, the course unit on "Four Seasons" visual imagery composition was used as the thematic platform for students' design projects, in which concept mapping was employed to scaffold design thinking and Gen AI was introduced to support visual exploration. Furthermore, a co-assessment mechanism involving four teachers and experts was adopted to evaluate students' works, thereby operationalizing the teaching intervention and fostering co-learning among instructors and students while working toward the goal of enhancing students' learning effectiveness.

2. Research Questions in the Teaching Context

In the present teaching context, two major problems were identified in the Plane Composition course for design students in Taiwan.

2.1 The First problem in the teaching context

Design students in Taiwan frequently replicate the example works demonstrated by the instructor in class without substantial critical thinking. They tend to reproduce similar visual forms by applying analogous methods, resulting in "copied" or merely imitative design outcomes. Many students lack the ability to think through compositional problems or to associate abstract concepts with visual solutions in plane composition. Consequently, they often "recreate" the instructor's sample works or imitate design works found online, rather than developing original responses. Intended solution: To address this issue, the present teaching practice research proposes the use of concept mapping as a pedagogical strategy to enhance students' associative thinking, critical thinking, and creativity. By structuring and visualizing conceptual relationships, concept mapping is expected to strengthen students' capacity for form–meaning transformation and, in turn, improve their visual design creativity in plane composition. At the same time, the integration of generative AI into the classroom setting is intended to increase students' interest in both design theory and practical application, thereby fostering more engaged and reflective learning in the studio environment.

2.2 The Second problem in the teaching context

A further issue observed is that design students in Taiwan generally lack the ability to appreciate and evaluate design works, both their own and those of others. Their engagement with completed works often remains at a superficial level, and they have difficulty articulating aesthetic judgments or applying clear criteria when assessing plane composition outcomes. Intended solution: To respond to this second problem, the study incorporates a co-assessment mechanism involving teachers and external experts. Through structured joint critique and evaluation sessions, this approach aims to enhance students' abilities in design appreciation and critical evaluation of plane composition works. In doing so, it is expected not only to improve students' visual design creativity, but also to support the achievement of the intended learning outcomes of the course unit.

3. Four Dimensions of the Research Aims and Purposes

The purposes of this study encompass four interrelated dimensions, which are specified as follows:

3.1 Teaching Dimension

This study aims to integrate concept mapping into the Plane Composition course in order to enhance students' creative design thinking. In addition, by incorporating generative AI into teaching practice, the study seeks to reduce students' learning anxiety in the classroom

and to support a more exploratory and reflective approach to compositional problem-solving.

3.2 Digital Learning Dimension

At the level of digital learning, this study intends to introduce generative AI directly into the physical classroom setting. By situating Gen AI tools within the studio environment, the research aims to increase students' interest in learning design theory and to sustain their attention and engagement during class activities.

3.3 Appreciation and Evaluation Dimension

This study further seeks to enhance students' abilities in design appreciation and critical evaluation of plane composition works. To this end, mechanisms of student self-assessment and co-assessment by teachers and invited experts are incorporated. Through these processes, the study aims to strengthen students' capacity to analyze and judge both their own and others' works, thereby improving their visual design creativity and achieving the intended learning outcomes of the course unit.

3.4 Design Dimension

Finally, at the design level, the study employs a course unit themed on "Four Seasons" visual imagery. The instructional goal is to guide students in integrating seasonal imagery with visual design elements such as points, lines, and planes and with geometric modes of expression. Through this process, students are trained to transform abstract imagery into concrete visual forms, thereby elevating the Plane Composition course to a higher level of conceptual and creative sophistication.

4. Teaching Design and Planning

The instructional design of this teaching practice research integrates multiple pedagogical approaches, including the use of generative AI, concept mapping, direct instruction (teacher-led lectures), appreciation and evaluation activities (co-assessment by teachers and experts), practice-based learning (hand-drawing, digital illustration, and generative AI), reflective teaching, project proposal presentations, and an exhibition-based teaching quality assurance mechanism.

The core course unit is themed "Four Seasons Visual Imagery Composition", through which students develop compositions based on the visual imagery of spring, summer, autumn, and winter. At the outset, the instructor introduces concept mapping of four-season visual imagery as a leading activity, guiding students to systematically explore and organize the semantic and perceptual connotations of seasonal imagery. This conceptual work is then linked to exemplar cases in Plane Composition, helping students first recognize the literal and figurative visual forms associated with four-season imagery and to experiment with creative variations.

After students gain an initial understanding of the meanings embedded in four-season visual imagery, they are further guided to transform these concepts into refined visual expressions by applying principles of design and aesthetics. In this process, students employ points, lines, and planes, together with geometric forms, to construct abstract compositions that embody seasonal atmospheres. Generative AI is integrated into both exploratory and refinement stages to support ideation, variation, and visualization, while hand-drawing and computer-based rendering ensure that students remain actively engaged in decision-making and formal development throughout the creative process.

5. Teaching and Research Outcomes

The teaching process and its corresponding outcomes in this study are summarized as follows:

5.1 Students' "Four Seasons" Concept Maps – Hand-Drawn Works

In the hand-drawn concept mapping phase, the instructor first guided students to recall and describe their personal experiences and perceptions of the four seasons—spring, summer, autumn, and winter. Each student wrote one of the seasonal themes ("Spring" , "Summer" , "Autumn" or "Winter") at the center of the drawing paper as the main concept, and then extended outward to develop branching keywords. Students were encouraged to employ a radial composition in their diagrams and to use simple visual symbols to represent associative ideas related to each season. Through this process, they began to externalize and structure their seasonal imagery in a visual–conceptual form (Figures 1 and 2).

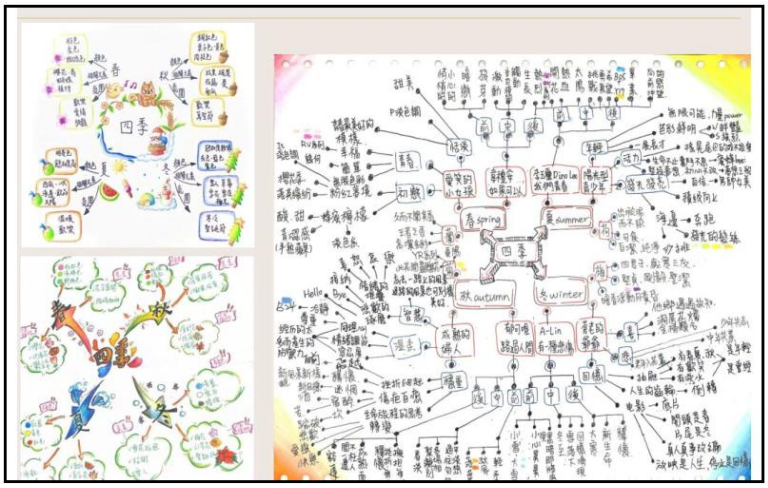


Figure 1. Hand-drawn concept map of the four seasons (with extensive branching)

Figure 2. Hand-drawn concept map of the four seasons (with fewer branching)

5.2 Students' "Four Seasons" Concept Maps – Computer-Based Production

In this stage of the course, students were guided to use cloud-based mind-mapping software to construct "Four Seasons Imagery Concept Maps" (see Figures 3 and 4). The purpose was to visually organize seasonal imagery, atmosphere, color associations, and compositional directions, thereby providing a structured basis for subsequent AI-generated images and Plane Composition design tasks. The instructional goals were threefold: (1) to develop students' ability to transform abstract verbal meanings into concrete design elements; (2) to foster systematic thinking about thematic content through concept mapping; and (3) to provide a well-structured input framework for generative AI text prompts (Prompts), thus supporting higher learning effectiveness in downstream design activities.

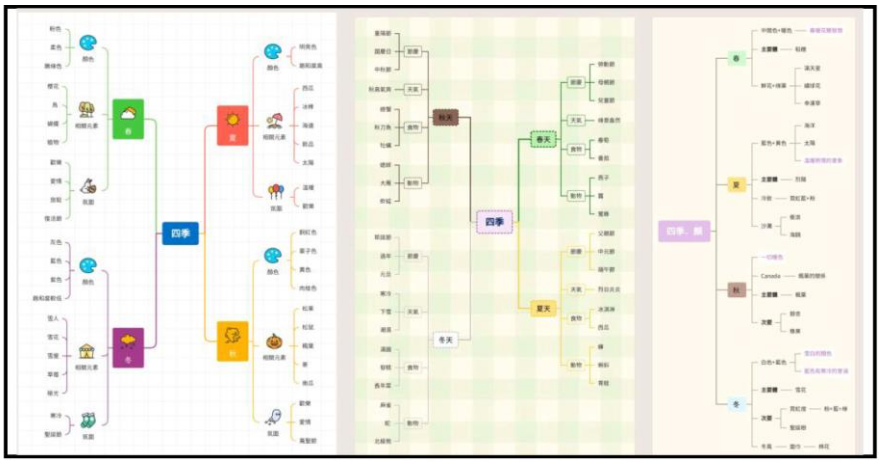


Figure 3. Example of a student's Four Seasons concept map created using computer-based mind-mapping software

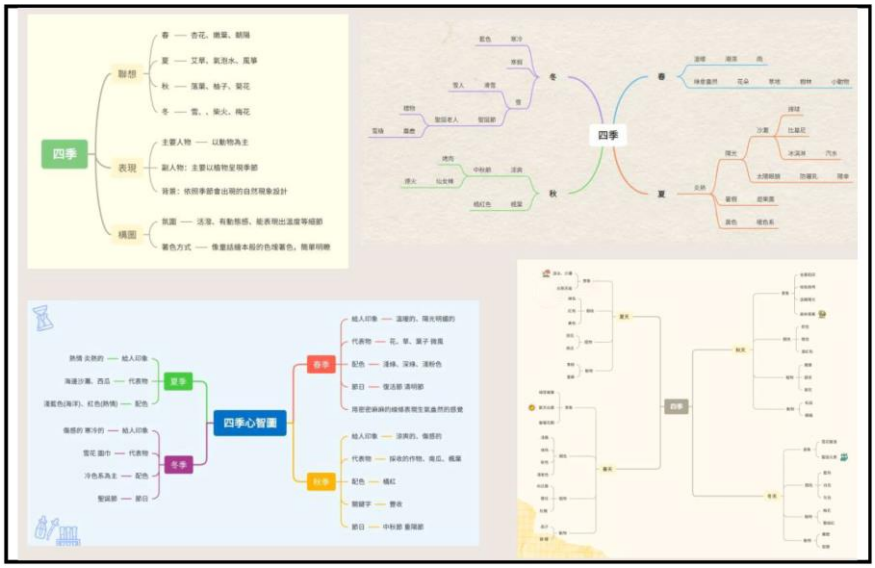


Figure 4. Example of a student's Four Seasons concept map created using GitMind mind-mapping software

Compared with hand-drawn concept maps, computer-based concept maps offered several advantages: a clearer hierarchical structure, nodes that could be flexibly edited and repositioned, and scalable canvases that allowed students to zoom in and out to view both local details and global structure. These affordances helped students move from fragmented creative associations toward a more structured visual communication design mindset. In practical implementation, students used

"Spring," "Summer," "Autumn," and "Winter" as first-level thematic nodes, and then extended outward to second-level nodes related to visual communication design, such as visual atmosphere, form vocabulary, compositional types, as well as visual focal points and visual flow.

From an instructional perspective, this study placed particular emphasis on using digital concept maps to strengthen students' capacity to translate abstract semantic descriptors into concrete visual design language. In constructing the conceptual structure of four-season imagery, students were required to consider how descriptive adjectives could be mapped onto specific visual parameters such as color, form, composition, and visual expression. These computer-generated "Four Seasons Imagery Concept Maps" subsequently served as an important foundation for both generative AI image production and plane composition design. Students could directly extract keywords from their maps and combine them into bilingual (Chinese–English) prompts, guiding the AI to generate images that aligned with specific compositional intentions. Through this process, the use of digital concept mapping not only supported more systematic ideation but also effectively enhanced students' creative thinking and learning effectiveness within the context of visual communication design.

5.3 Four Seasons Plane Composition Works — Hand-Drawn Sketches

In this study, the hand-drawn sketch phase constituted a critical early stage in the course design process. Its core purpose was to assist design students in transforming the relatively abstract semantic associations and imagery generated during the concept-mapping phase into concrete visual forms. In other words, the hand-drawn sketch was not treated merely as a "preliminary draft," but as an essential intermediate step in the transformation from verbal meaning to visual form, and thus a key bridge for students as they moved from textual concepts toward visual communication design expression.Design students were required to produce Four Seasons plane composition hand-drawn sketches (see Figures 5 and 6), using traditional drawing methods to visualize their compositional ideas. Through the deliberate use of line, area, spatial arrangement, shape, and proportion, they gradually established a visual foundation for subsequent digital creation and final plane composition works. In practical terms, students were asked to base their sketches on the "Four Seasons Imagery Concept Maps" developed in the previous phase, selecting a specific seasonal theme and considering how to apply basic principles and elements of visual communication design on a two-dimensional surface—for example, constructing the image using points, lines, and planes. Students employed geometric forms to organize the layout structure and used contrasts in shape size, variations in density, and directional emphasis to establish visual focus.

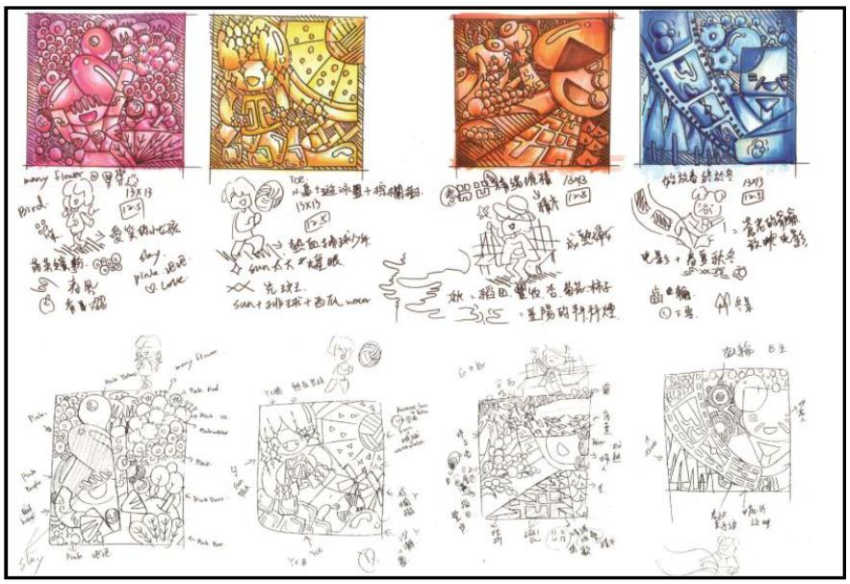


Figure 5. Example of a student's Four Seasons plane composition: hand-drawn sketch rendered with fineliner and marker pens

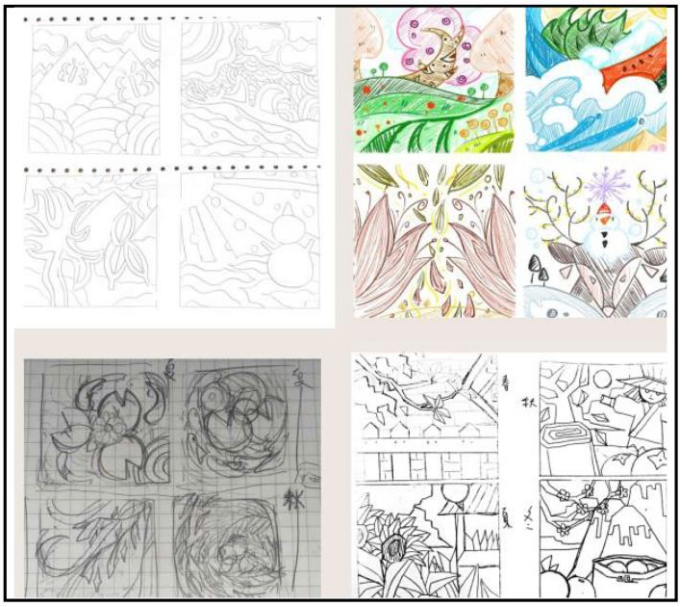


Figure 6. Example of a student's Four Seasons plane composition hand-drawn sketch rendered with graphite and colored pencils

In Figure 5, the hand-drawn sketch was executed using fine liners and marker pens, resulting in clear, crisp lines that are well-suited to expressing strong rhythm, repetitive structures, and geometric tension. In Figure 6, the sketch was rendered with graphite and colored pencils, allowing for softer strokes and gradated color transitions that convey more delicate seasonal atmospheres and nuanced emotional tones. At this stage, students were also guided to reflect on different types of composition commonly discussed in visual communication design, such as radial composition, symmetrical and asymmetrical balance, and banded or strip-like divisions of the picture plane. Through the process of hand-drawn exploration, students attempted to translate the key terms from their concept maps into specific line directions, spatial groupings of forms, and compositional arrangements. This sketching phase therefore not only laid the formal groundwork for later digital completion and the use of generative AI as a visual reference, but also contributed to enhancing students' design thinking and performance in plane composition, strengthening their capacity to move from conceptualization to visual realization.

5.4 Final Four Seasons Plane Composition Works Produced Using Digital Illustration and Generative AI in This Study

By the end of the semester, this teaching practice culminated in an exhibition of 48 finalized student works. All Four Seasons plane composition pieces were completed using a combination of digital illustration and generative AI (Figure 7). Collectively, the works span a spectrum from representational to highly abstract, and from naturalistic depiction to symbolic visual expression. Some students retained recognizable natural motifs—such as flowers, trees, and leaves—and reinterpreted them through geometric simplification and planar abstraction. Others moved away entirely from figurative representation, constructing the seasonal themes solely through points, lines, planes, and geometric forms, thereby developing a predominantly abstract visual vocabulary for expressing the four seasons. In terms of visual communication design, many works employed multilayered geometric constructions, using overlapping color fields and the juxtaposition of geometric units to create a visually perceptible sense of seasonal atmosphere and temporal variation.

From the perspective of composition and visual hierarchy, most works demonstrated an ability to organize relationships among seasonal elements by manipulating size contrast, differences in chroma and value, and positional arrangement on the page to establish clear visual focal points. Seasonal imagery was often transformed into dominant figure shapes,

supported by geometric backgrounds that provided structural context and visual rhythm, allowing the compositions to balance both stability and tension. In addition, some students adopted asymmetrical balance or deliberately shifted the visual center of gravity to heighten visual tension and dynamism. Analyzed through the lens of geometric form and principles of plane composition, the Four Seasons works generally exhibited a relatively high level of formal control. Students were able to employ rectangles, circles, polygons, and their variations to construct coherent pictorial structures, reflecting a solid understanding—and practical application—of key compositional principles such as proportion, contrast, repetition, gradation, and aggregation/dispersal acquired in the Plane Composition course. In this stage, generative AI primarily served as a tool for visual ideation and stylistic exploration: students drew upon AI-generated images as sources of inspiration, then restructured and refined them using digital illustration software. This process indicates that, even with AI assistance, the final outcomes retained clear evidence of human design decision-making and individual style. The finalized Four Seasons plane composition works not only embody the design students' learning achievements in color usage, geometric form, plane composition, and visual communication, but also demonstrate the effectiveness of integrating generative AI into Plane Composition instruction. The results suggest that this approach can meaningfully enhance design students' visual communication performance and their capacity for creative compositional development.

Figure 7. Final Four Seasons plane composition works by design students created using digital illustration and generative AI

5.5 Teaching Context and Course Platform in This Study

The teaching context of this study comprised the specialized computer classroom and the graphic design studio of the Department of Visual Communication Design at Tainan University of Technology. The course was offered over one semester (18 weeks), with three contact hours per week. In the computer classroom, each student was equipped with an individual workstation, and the environment supported the use of generative AI platforms alongside various digital drawing and design software. This setup enabled the instructor to demonstrate, in real time, the complete workflow from concept mapping and AI-generated imagery to final plane composition output within the physical classroom. The graphic design studio, in turn, provided ample desk and display space suitable for hand-drawn sketching, posting works on walls, group discussions, and critique sessions, thereby

facilitating a pedagogical model that effectively integrates traditional hand-based practice with digital creation. As shown in Figure 8, students worked one-to-one with computers in the lab, engaging with both AI tools and digital illustration software in a highly interactive, practice-oriented learning environment.

With respect to the course platform, this study adopted the university's "Online University" system as the primary digital teaching and learning platform for the course (see Figure 9). The platform offers functions such as announcement posting, course material uploads, assignment submission, online quizzes, and discussion forums, and it preserves a comprehensive record of students' learning trajectories. The instructor uploaded lecture slides, demonstration videos, generative AI operation guidelines, sample concept maps, and assessment rubrics, enabling design students to repeatedly review and practice after class, thus reinforcing content that could not be fully absorbed during limited in-person sessions. Through the assignment submission and online feedback functions, students were able to upload artifacts from different stages of their work (e.g., concept maps, hand-drawn sketches, AI generation process screenshots, and digital final compositions). The instructor could then provide staged, text-based or annotated feedback, helping students clearly identify areas for improvement at each phase of the design process.

The Online University platform also served as an extended learning space for design students. In the discussion forums, students could share their prompt designs, AI-generated images, and compositional drafts, observe their peers' approaches to idea development and visual representation, and thereby stimulate new creative associations. The week-by-week organization of teaching materials and assignment management within the platform further supported students in tracking course progress and important deadlines. For design students, the course platform functioned not merely as a repository for file access and assignment submission, but as a crucial bridge between the physical classroom and the digital learning environment. It allowed the entire teaching–learning process of integrating generative AI into Plane Composition to be systematically documented, revisited, and reflected upon, ultimately contributing to the enhancement of students' learning effectiveness.

Figure 8. Teaching context of this study: computer laboratory and design studio environments

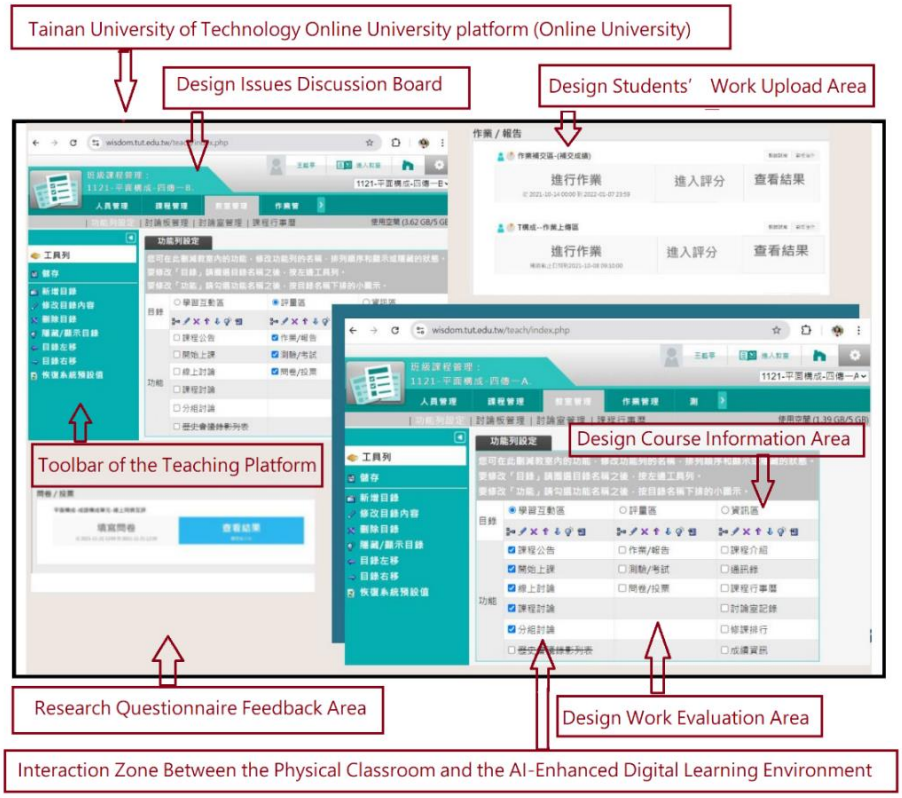


Figure 9. Teaching platform used in this study and its online areas related to design instruction

5.6 Special Topic Guest Lectures in the Design Course

In this study, a series of special topic guest lectures was intentionally incorporated into the course design (Figure 10), allowing the "teaching activities and extended practices" to further develop the pedagogical trajectory and educational implications of the Plane Composition course. Within the instructional framework, these guest lectures played a supporting and extending role, functioning not only as an additional source of knowledge input for students, but also as a crucial bridge between theoretical instruction and practical application. Specifically, instructors and industry professionals with substantial experience in design practice and the application of generative AI were invited to deliver guest talks. Through these lectures, students were able to build upon the foundational learning from the Plane Composition course and to understand, from multiple perspectives, the significance and emerging trends of generative AI and concept mapping in contemporary visual design. This contributed to deepening and broadening the teaching practice implemented in the present study. In terms of concrete benefits for students, the guest lectures helped them broaden their horizons in visual design and enhance their professional understanding of the field. Moreover, when speakers presented real-world project cases, students gained a clearer sense of the practical contexts in which generative AI and concept mapping can be integrated into design workflows. This, in turn, reinforced the relevance, authenticity, and applicability of the learning experiences provided by the course.

Figure 10. Special topic guest lectures in this study's visual design professional course

5.7 Presentation of Learning Outcomes and Public Exhibition

In this course, design students experienced a complete design process that integrated generative AI and concept mapping, moving from initial imagery ideation through form transformation to the final plane composition output. To extend this learning process and its outcomes beyond the classroom into an authentic exhibition context, the study organized a semester-end exhibition entitled "The Four Seasons Imagery Composition Exhibition", serving as a platform for the presentation and exchange of learning outcomes. The exhibition was held in the gallery space of the Design Building at Tainan University of Technology and featured a total of 48 works, all of which were final "Four Seasons plane composition" pieces produced by students using a combination of digital illustration and generative AI. In terms of spatial layout and visual communication, the exhibition was structured around four main zones—Spring, Summer, Autumn, and Winter—which functioned as the primary organizational framework. Each zone was differentiated by corresponding thematic colors and graphic signage, guiding visitors along a viewing path that metaphorically moved "from spring into summer" and "from autumn into winter," thereby creating a seasonally immersive visual experience.

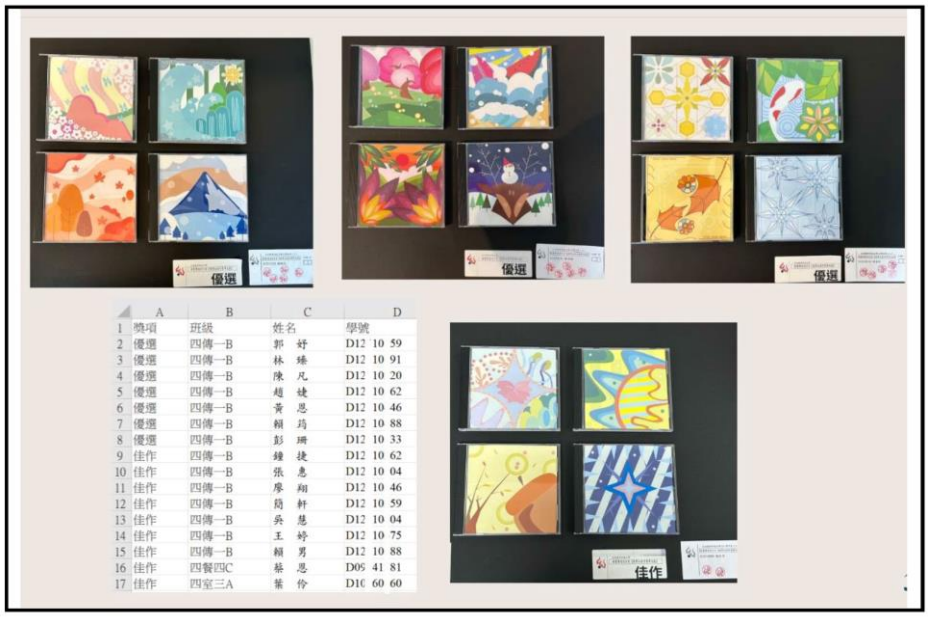
Each student was allocated an individual display panel that included the work itself, the title, and a clear indication of the seasonal theme. This arrangement enabled viewers not only to appreciate the visual form of the compositions, but also to understand the underlying design thinking and the process of form–meaning transformation. In this way, the exhibition reinforced the visualization of the teaching–learning process, making the connection between classroom activities and final outcomes more explicit. Design students, in turn, used the exhibition space as an opportunity to observe and interact with one another's works, learning from different approaches to composition, color application, and the use of generative AI as a creative tool. The exhibition setup and on-site views with instructors and students are shown in Figures 11 and 12, where the works are displayed in a regular, grid-like arrangement along the walls, creating a visually coherent environment that reflects both professional design standards and an atmosphere conducive to learning. In addition, a selection and award mechanism was incorporated into the exhibition: teachers and invited experts were asked to evaluate the works and identify award-winning pieces and recipients (Figure 13).

The selected works typically demonstrated strong performance in form–meaning transformation, visual composition, and the integration of AI-generated imagery with design intent, reflecting students' growth in both visual communication competence and creative compositional ability throughout the course. The exhibition of learning outcomes functioned not only as a public showcase of student work, but also as an important starting

point for students to reflect on their own learning trajectories, articulate their design processes, and build confidence in their emerging identities as designers.

Figure 11. Exhibition of learning outcomes from this design course including exhibition setup and on-site display

Figure 12. Exhibition of learning outcomes from this design course with all instructors and students present at the exhibition venue



	A	B	C	D
1	獎項	班級	姓名	學號
2	優選	四傳一B	郭　妤	D12 10 59
3	優選	四傳一B	林　臻	D12 10 91
4	優選	四傳一B	陳　凡	D12 10 20
5	優選	四傳一B	趙　捷	D12 10 62
6	優選	四傳一B	黃　恩	D12 10 46
7	優選	四傳一B	賴　筠	D12 10 88
8	優選	四傳一B	彭　珊	D12 10 33
9	佳作	四傳一B	鍾　捷	D12 10 62
10	佳作	四傳一B	張　惠	D12 10 04
11	佳作	四傳一B	廖　翔	D12 10 46
12	佳作	四傳一B	簡　軒	D12 10 59
13	佳作	四傳一B	吳　慧	D12 10 04
14	佳作	四傳一B	王　婷	D12 10 75
15	佳作	四傳一B	賴　男	D12 10 88
16	佳作	四餐四C	蔡　恩	D05 41 81
17	佳作	四室三A	葉　伶	D10 60 60

Figure 13. Award-winning works and list of award recipients from the learning outcomes exhibition in this design course

6. Analysis of Students' Learning Effectiveness

In this study, a work evaluation rubric and records of students' learning processes were used to comprehensively analyze the learning effectiveness of students in the cognitive, skills, and affective domains after the integration of generative AI and concept mapping into the Plane Composition course. The differences reached a statistically significant level, indicating that the teaching intervention in this study had a positive effect. In terms of learning effectiveness, the results showed that students achieved improvement in their aesthetic appreciation of plane design works and in their cultural competence; that, with compositional design thinking as the main axis, they were trained in plane design methods and their creative thinking ability in plane design was enhanced; that they improved their ability to apply design principles of plane composition to create geometric design works; that, through training in composition using the basic design elements of point, line, and plane, they improved their performance in fundamental planar form design; that, by working from the visualized concepts of "image composition" in concept maps, they strengthened their ability in visual design transformation and, in doing so, also enhanced their design thinking; and that, through feedback obtained from self-assessment and co-assessment by teachers (experts), their design ability was further improved and their learning effectiveness was increased.

7. Teachers' Instructional Reflections and Students' Learning Feedback

In the teaching practice of the Plane Composition course, the instructor observed that the introduction of generative AI changed the traditional pacing of design instruction and the patterns of students' learning interactions. Through classroom observation and reflection, the instructor noted that AI tools not only enhanced students' understanding of form–meaning transformation in compositional design, but also allowed students to explore visual possibilities in a "dialogue-based" manner with the AI system. The main points of the teacher's instructional reflections and students' learning feedback are as follows:

(1) The adoption of teaching methods that integrate new technologies requires teachers to possess more advanced digital teaching competencies and knowledge of technological application.

(2) Teachers need to continuously adjust course content and teaching methods in order to respond to students' diverse learning needs in the future.

(3) In this study, generative AI was able to provide more personalized learning support and to carry out automated evaluation and feedback for creative design.

(4) The study explored a variety of advanced AI tools in visual design education, thereby providing students with a richer learning experience.

(5) The Plane Composition course was combined with other disciplines through the use of generative AI for interdisciplinary teaching, helping to cultivate students' visual design literacy.

(6) The instructor in this study integrated AI tools into teaching and used digital tools to improve the quality of instruction.

(7) Students' feedback on the use of generative AI as a learning aid was mostly positive; they felt that this interactive teaching approach increased their learning interest and motivation, and strengthened their confidence in learning.

(8) With generative AI, students were able to obtain immediate answers to questions and learning suggestions after class, which helped to enhance learning efficiency and supported ubiquitous learning.

(9) The concept mapping tools used in this study helped students to better visualize their design thinking, thereby improving their creative thinking and design abilities.

8. Conclusion

The findings of this teaching practice research indicate that the integration of generative AI and concept mapping into the foundational Plane Composition course for first-year design students in Taiwan effectively addresses two major issues observed in the teaching context. First, the instructional intervention helped reduce students' tendency to merely "replicate" instructor-provided examples or online works, and contributed to improving their deficiencies in design thinking and associative thinking. Second, the approach enhanced students' abilities in the appreciation and evaluation of design works, both their own and those of others. By structuring the course around a "Four Seasons Visual Imagery" thematic unit and combining a sequence of pedagogical strategies—hand-drawn concept maps, Git Mind-based concept mapping, generative AI–assisted image generation, hand-drawing and digital finalization, co-assessment by teachers and experts, and public exhibition of learning outcomes—the study demonstrated positive gains in multiple aspects of student learning. These include improvements in form–meaning transformation, creative thinking, visual composition performance, self-reflection on design outcomes, and the ability to appreciate and critique visual works. At the same time, the use of generative AI in the classroom setting was found to effectively reduce design-related anxiety for some students, while enhancing their learning motivation and level of engagement.

The teaching model developed in this study has been empirically shown to be both practical and implementable across four key dimensions: the teaching dimension, digital learning dimension, appreciation and evaluation dimension, and design dimension. It thus provides concrete reference for foundational design education in higher education, particularly for curriculum planning and pedagogical innovation in art and design programs in the era of AI. Future work will extend this teaching model to other design-related courses and domains, and incorporate more comprehensive quantitative measures of learning outcomes as well as longitudinal follow-up. Such efforts will help further validate the feasibility, sustainability, and broader impact of this approach to integrating generative AI and concept mapping into design education.

Acknowledgments

This teaching practice research was supported by funding from the **Ministry of Education, Taiwan**: **"MOE Teaching Practice Research Subsidies Program"** under Project No. PHA1122976. The authors would like to express their sincere appreciation to the students who participated in this study, including all first-year students enrolled in the Plane Composition course in Classes VCD-1A and VCD-1B of the Department of Visual Communication Design at Tainan University of Technology (Taiwan), as well as auditing students and senior students who elected to take the course. We are deeply grateful for their willingness to provide learning records and design works for research purposes, all of which were collected in accordance with informed consent and authorization procedures. Our thanks also extend to the course teaching assistant (TA) and the project assistant for their valuable support in the implementation and administration of this project.

REFERENCES

[1] *Design Thinking for Enhancing Student Creativity and Critical Thinking in Digital Media Learning. Semarak International Journal of Creative Art and Design, 4(1), 24-37.*

[2] *Bartlett, K. A., & Camba, J. D. (2024). Generative artificial intelligence in product design education: Navigating concerns of originality and ethics.8(5), 55-64.*

[3] *Bello, R. W. (2025). Artificial Intelligence for Public Health in Africa: Advancing Mental Health, Maternal Care, and Rural Health Equity. Maternal Care, and Rural Health Equity, LIBERTE JOURNAL, 13(10), 30-42.*

[4] *Lin, W. Y., Zhou, P. R., and Cai, M. Z. (2021), Research on the Teaching Practice of Using Mind Mapping and AI Feedback Generative AI to Enhance Students' Web Design Professional Ability, Taiwan Education, (730), 29-43.*

[5] *Liu, G. X. (2021), An Exploration of the Creative Self-Efficacy Construct Analysis of Learners in Digital Image Creation Courses in University Art, Art Education Research, (41), 73-108.*

[6] *Ng, S. L., & Ho, C. C. (2025). Generative AI in education: Mapping the research landscape through bibliometric analysis. Information, 16(8), 657.*

[7] *Su, H., Zhang, J., & Tang, S. (2025). Artificial Intelligence Innovations in Visual Arts and Design Education. In Integrating Technology in Problem-Solving Educational Practices (pp. 219-240). IGI Global.*

[8] *Wang, H. H. (2019), A Study on Teaching Practices to Enhance the Effectiveness of Innovative Thinking Learning, Report on the Results of Teaching Practice Research Project.*

[9] *Yu, Y. L. (2021), The Presentation Methods and Learning Effectiveness of Hand-Drawn Design Teaching Demonstration, Report on the Results of Teaching Practice Research Project.*