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Research on the Application of Innovative Design Thinking in Corporate Training for GWM

Zhenghui Pan[1,3,a,*], Yang Sun[2], Wangfa Feng[3], Wei Zheng[2], Jian Li[2], Zhisheng Zhang[1], Qingsheng Zeng[3], Li Zhen[3], Lin Ma[3], Kexiang Liu[3]

[1]IoT Technology and Application Areas, Doctorate in Computer Science, San Antonio Catholic University of Murcia, Murcia, Spain
[2]Strategic Business Management Research Areas, Doctor of Business Administration, Russian University of Transport, Moscow, Russia
[3]AIoT Laboratory, IoT Intelligent Link Technology and Application Areas, Great Wall Motor Holdings Group, Shanghai, China
[a]pzhoz@outlook.com
[*]Corresponding author

Abstract: *This study adopts design thinking as a methodological approach, constructing a design thinking model through the analysis of relevant literature, and integrating it with the teaching design principles and elements for corporate training at Great Wall Motors (GWM). The designed model is oriented around design thinking and includes six stages: discovery stage, focusing on needs and problem identification; definition stage, organizing information and clarifying problems; conceptualization stage, proposing ideas and developing solutions; prototype stage, optimizing solutions and creating prototypes; improvement stage, conducting research and optimizing designs; and evaluation stage, presenting results and exchanging feedback. Three projects of increasing complexity were designed for each stage, providing participants with design thinking tools to aid their learning. The teaching process was refined and optimized over three rounds of action research. At the end of the teaching practice, the effectiveness of the teaching and learning model was analyzed through pre-and-post tests on creativity dispositions, learning outcomes, and interviews with coaches and learners. The teaching design model was revised and applied to the next team training activity at GWM.*

Keywords: *Design Thinking; Action Research; Prototyping; Creative Disposition*

1. Introduction

1.1. Innovative Design Thinking

The concept of 'design thinking' can first be seen in Simon's The Sciences of the Artificial[1], where it is mentioned that the biggest difference between artificial and natural sciences is that artificial sciences cannot be designed without human beings, and that the integration of artificial and natural sciences cannot be achieved without human thinking. Human thinking is a way of solving problems.

Design thinking is a way of solving problems, and creative design thinking is a more efficient and rational way of thinking about the problems that people encounter[2]. As a way of thinking, it is recognised by most people for its ability to synthesise, to stimulate people's problem-solving skills, to increase their sensitivity to problems and, in the end, to rationalise and find the best solution to them[3].

1.2. Creativity

Creativity is one of the skills needed in the 21st century because creativity skills enable people to solve problems through creativity, communication and collaboration[4].

There is still no consensus on the definition and components of creativity. According to Shan (2023)[5], creativity is the ability to think, to solve problems in an innovative way, and to produce original and valuable products. Jiang, et al. (2023)[6] sees creativity as the ability to generate new solutions to new problems and to form new products. Jiang, et al. (2023)[7] sees creativity as a cognitive skill that provides a solution to a problem and creates something that has utility and novelty. Zhao, et al.(2023)[8] synthesise the various factors that influence creativity and define it as "the interplay between ability, process and

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environment through which an individual or group produces a perceptible product that is both novel and useful in a social context". Zhang, et al. (2023)[9] argues that creativity refers to any product that is both novel and appropriate (e.g. ideas, solutions, artwork, stories, etc.) Zhu and Fu [10] suggests that three schools of thought, institutionalism, structuralism and contextualism, all have relevant accounts of creativity. Inspirationalists argue that creative ideas or solutions can be inspired by unusual ideas, connections, associations, or even unrelated problems. Inspirationalists also suggest methods such as brainstorming and reviewing existing work to promote the development of creativity. Structuralists believe that people can be creative if they follow specific steps in an orderly manner[11]. For example, Zhang's, et al. (2023)[12] model of the components of creativity consists of five stages: Stage 1: Task statement or problem formulation, Stage 2: Preparation, Stage 3: Idea generation, Stage 4: Idea validation and Stage 5: Evaluation of results. Amabile believes that Stages 1 and 3 can help increase the number and novelty of ideas, and Stages 2 and 4 can help increase the usefulness or appropriateness of ideas. According to Ma, et al. (2021)[13], creativity is a higher-order thinking ability, manifested as the participant's ability to think outside the box during problem solving, and consists of both intellectual and non-intellectual elements, the results of which point to creative ideas or work.

In summary, this research suggests that creativity is the ability to solve real problems and create valuable, practical and innovative products, and is made up of intellectual and non-intellectual factors, including imagination, logical thinking and divergent thinking, and non-intellectual factors such as risk-taking, curiosity and challenge. Design thinking, as a human-centred approach, emphasises helping people to think independently, creatively generate solutions to real problems, and ultimately design and produce products that meet the needs of users, and its objectives coincide with creativity[14]. It is therefore very feasible to consciously develop creative intellectual and non-intellectual factors in different parts of design thinking oriented teaching and learning activities in order to enhance the creativity of learners.

1.3. Constructivist Theory

Constructivism is the idea that people construct their own understanding and knowledge of the world by experiencing things and reflecting on those experiences. When people encounter something new, they must reconcile it with their previous ideas and experiences. Each person learns new knowledge by building on their own previous experiences and knowledge structures, constructing their own knowledge experiences in relation to their own understandings, achieving a reorganization, transformation and transformation of knowledge experiences. Participants must therefore ask their own questions, explore and evaluate what they are learning[15].

Constructivism transforms learners from passive recipients of information to active participants in the learning process. Learners are always guided by the coach and actively construct their own knowledge, rather than mechanically absorbing it from the coach's lectures or textbooks[16]. In the classroom, a constructivist view of learning usually means encouraging participants to use active techniques, internalize more knowledge and skills through collaborative interaction in a learning community, and then reflect on what they have done and how their thinking has changed. During corporate team training, coaches need to teach participants to use tools to form and test their ideas and guide them to reflect on the problems they encounter in practice, where they enhance their ability to integrate information and better understand knowledge through a process of continuous reflection[17].

2. Models and Tools for Design Thinking

Schools and companies around the world have also put forward different design thinking models in relation to their own characteristics[18]. This study has collated the design thinking of different scholars and organisations (*as shown in Table 1*), and it can be found that although the names and number of stages in the human-centred design process vary across fields and organisations, they all basically revolve around the four main stages of empathy, definition, conceptualisation and implementation, and they They are all characterised by the human-centred, iterative nature of the process. This study will combine the pedagogical characteristics of open source hardware with the design thinking model as support to build a team training design model that fits GWM.

2.1. EDIPT Model

The EDIPT model (*as shown in Figure 1*), proposed by Stanford University's D.School, is the most popular design thinking model today and consists of five stages: Empathise-Define-Ideate-Prototype-

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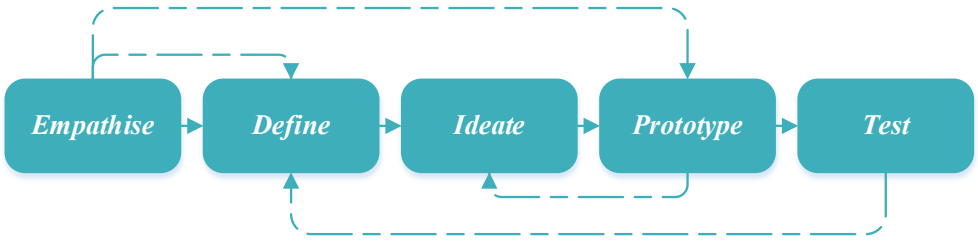
Test[19].

Table 1: Comparative Analysis of Design Thinking Models

Models	Components of Models			
	Empathy	Define	Idea	Implementation
IDEO	Discover	Explanation	Idea	Experimentation, Improvement
British Design Council	Discover	Define	--	Development, Delivery
D.School	Empathy	Define	Idea	Prototyping, Testing
Hasso Plattner Institute of Design	Comprehension Observation	Perspectives	Idea	Prototyping, Testing
HCD - Human-Centred Design	Listen	--	--	Creation, Delivery
GoogleVentures	Comprehension	Define	Dispersion, Idea	Prototyping
Pontius	Comprehension Empathy	Define	Idea	Prototyping, Testing
Meinel, VonThienen	Empathy	Defining roles	Idea	Test prototypes, Take home

Source: Collated by this Research



Source: Collated by this Research

Figure 1: A Five-Stage Process of EDIPT Model

2.1.1. Empathise

Empathise, which can also be understood as empathy, is the first stage of the design process and is an important expression of people-centeredness. It can be thought of as the gathering of facts and information, the deepening of understanding of the issues involved by observing, participating in and understanding the experiences, characteristics and needs of the subject, and looking for more information about the area in question, not only through surveys and interviews, but also through observation, where the designer is able to put himself in the shoes of the user and discover their dilemmas and problems by observing people's behaviour and their environment[20]. The designer, by observing people's behaviour and their environment, is able to put himself in the shoes of the user and identify their dilemmas and problems.

2.1.2. Define

Definition means putting together all the information created and gathered during the empathy phase and stating the problem, finding innovative goals that are both feasible and valuable, and finally defining a problem that is meaningful and feasible.

2.1.3. Ideate

In the ideation phase, designers come up with ideas. Based on an understanding of the user's needs, analysis and identification of the problem to be solved, team members can brainstorm and stimulate free-thinking using such conceptual techniques as brainstorming, brainwriting, SCAMPER, the nine-box method and six thinking caps to generate as many ideas or solutions to the problem as possible in a short period of time, and compare and choose the best to finalise the solution.

2.1.4. Prototype

Prototyping is an experimental phase which is the quicker and simpler part of the design process to

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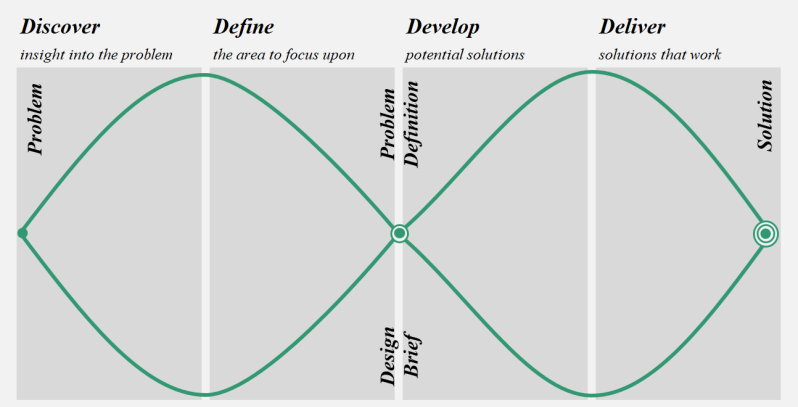
determine the best solution to the problems identified in the first three phases. Prototypes can be sketches, models or cardboard boxes, and solutions are implemented in prototypes, which are a quick way of communicating ideas. While designers often fail in creating prototypes and need to research, refine and re-examine them, they also gain a better understanding of the product they are designing and the problems that exist in the process.

2.1.5. Test

In the testing session, the designer tests the prototype created earlier and collects feedback from the object. Through testing, the designer and the object need to determine the feasibility of the functionality and whether the product meets the user's needs, thus deciding whether modifications or innovations are needed, after which adjustments are made based on user feedback and the designer needs to return to the definition or prototype stage, a process that reflects the iterative nature of design thinking.

2.2. Double Diamond Model

The Double Diamond Model[21] (*as shown in Figure 2*) is one of the most influential models in the design thinking framework. It was developed by the British Design Council to provide design practitioners with a workflow that guides them through each stage of the process, from concept to finished product. Specifically, the Double Diamond model describes how the two stages of divergent and convergent thinking develop together. It consists of four stages in two parts: the problem space (discovery, definition), and the solution space (development, delivery).



Source: Collated by this Research

Figure 2: A Four-Stage Process of Double Diamond Model

2.2.1. Discover

Discovery means finding the problem. At this stage, the designer needs to communicate and discuss with the user and to gain a preliminary understanding of the real needs of the user and the real problems that need to be solved by means of user research, market surveys, etc. In the process, the designer needs to store and manage the information that has been collected well.

2.2.2. Define

The goal of the definition phase is to take the information and data gathered in the 'discovery' phase and process it to identify a problem that can be solved. During the definition phase, the designer needs to filter out useless information and assess the realism of what can be done.

2.2.3. Develop

The development phase is when implementation begins, when design begins. This phase marks the beginning of the actual design process by putting previous ideas into practice. The development phase requires multidisciplinary collaboration, meaning that designers work in teams with people from other disciplines to solve problems, share creativity and demonstrate solutions by constructing sketches or prototypes.

2.2.4. Deliver

The delivery phase includes the final testing, formal signing off of the product for production and release. Final testing entails checking all aspects of the product, such as performance testing and

ISSN 2616-5902 Vol. 6, Issue 2: 37-46, DOI: 10.25236/AJBM.2024.060206

compatibility testing. During this process, designers need to communicate with users whether their requirements have been met, and make adjustments and iterate based on their feedback. After the product is released, designers also need to gather feedback from the market and ensure that their ideas and comments are reflected in each new version of the design.

2.3. Research on Design Thinking Support Tools

Design thinking tools help teams to combine ideas and create ideas. Each tool supports specific steps of the design thinking process and comes in a variety of styles (*as shown in Table 2*)[22].

Table 2: Research on Design Thinking Support Tools

Stage	Main Tasks	Tool Support
Discover	Understanding user needs and the real problems that need to be solved	Interview outline, observation outline, empathy map, scenario story, role play, stakeholder map, observation video method, 5W1H method
Define	Integrating and filtering information to clarify issues	User Journey Map, POV Point of View Statement Method, HMW, Insight Cards, Point Voting Method, User Profiling
Ideate	Propose a solution	Scenario report, brainstorming, nine-box grid, SCAMPER, KJ, final ideal solution, world coffee, scenario comparison table 2*2 matrix
Prototype	Putting solutions into practice, communicating ideas quickly and identifying the best solutions	Rapid prototyping sheets, design briefs, sketching, physical prototyping, co-creation workshops, minimum viable products, storyboarding
Test	Optimisation and adjustment based on user feedback, iterative	User testing, feedback diagrams, SWOT, story method test forms, interview outlines, observation outlines

Source: Collated by this Research

3. Application of Design Thinking in Company Practice

By comprehensively comparing design thinking models, summarising the common features and differences, and combining them with the design process of team training in G enterprises, this study constructs a design thinking-oriented instructional design model (*as shown in Figure 3*). The model begins with a pedagogical analysis (content analysis, learner analysis, and pedagogical goal analysis) and divides design thinking into six segments (*as shown in Table 3*): discovery, definition, conceptualisation, prototyping, improvement, and evaluation, each of which is interlocked, and the whole process is non-linear and iterative, so that problems found in any segment can be returned to the discovery phase to be completed again[23].

Corresponding coaching activities and learner activities are designed for each process of Design Thinking. The teaching process is problem identification, problem clarification, problem solving, reflection and evaluation, and finally the effectiveness of learner learning and teaching practice is tested by analysing the results of the learner learning effectiveness questionnaire, comparing creativity tendencies (pre-test and post-test), and conducting interviews with coaches and learners.

Table 3: Design Thinking Oriented Team Training Programme for GWM

Teaching Sessions	Coaching Activities	Trainee Activities	Design Intent	Design Thinking Methods
Discover	(01) The trainer provokes the trainee to think by showing the promotional film of the project and asks the trainee what they think after watching the film and how to have any suggestions for implementation. (02) Guide the trainees to think about what intelligent functions are available. (03) Group the trainees and fill in the 5W1H form. (04) Ask the trainees in each group to share the 5W1H forms they have filled in, and the trainer will comment on and guide them.	(01) Watching a promotional film, thinking about it and proposing measures. (02) Trainees think about the questions and what smart features they would like to have, assuming they are the users. (03) Trainees form groups, discuss, fill in forms together and share on stage.	The promotional film stimulates the interest of the trainees, triggers their attention and thinking about the project the team is responsible for, empathises when filling in the form and thinks from the user's point of view.	(01) 5W1H forms. (02) Multimedia digital resources.
Definition	(01) The trainer provides the POV form to the trainee. (02) The trainee is introduced to the meaning of the POV form, provided with examples, guided to identify what problem the designed product ultimately needs to solve, thought about the need to solve the problem, and	(01) Discuss in small groups, understand the example POV form given by the coach and identify the final problem to be solved in relation to the 5W1H form completed in	Identify the problem and locate it.	(01) POV forms.

ISSN 2616-5902 Vol. 6, Issue 2: 37-46, DOI: 10.25236/AJBM.2024.060206

	provided with guidance for the trainee.	the previous stage.		
Ideate	(01) The trainer introduces the principles of brainstorming and the creation of a mind map to the trainees. (02) The trainees are asked to brainstorm and conceive solutions within a certain period of time, and guidance is given to the solutions proposed by each group, and discipline and time are controlled.	(01) The trainee brainstorms and proposes solutions to the problems identified to be solved. The solutions include the division of tasks and the materials to be used in the implementation of the project.	Trainees use brainstorming to actively think outside the box, think about solutions and improve group cooperation skills in the process of developing solutions.	(01) Brainstorming mind maps.
Prototype	(01) The trainer asks the trainee to prototype and instructs the trainee.	(01) Based on the solution, select the appropriate components, connect the circuit, write the program and implement the function.	It allows trainees to experience the process of making works and to practice their hands-on skills.	

Source: Collated by this Research

Table 3(Continued): Design Thinking Oriented Team Training Programme for GWM

Teaching Sessions	Coaching Activities	Trainee Activities	Design Intent	Design Thinking Methods
Improvements	(01) The coach arranges for each group, each group invites the other group to experience the work, points out any problems found, and makes notes and corrections.	(01) Each group invites students from the corresponding group to experience the work according to the coach's arrangement, recording the problems they find and making corrections, iterating on the design process in the process.	The trainee invites members of the counterpart group and is able to identify unidentified problems, better iterate and improve the work.	(01) Improvement record sheet.
Evaluation	(01) Ask each group to present their work on stage. Trainees are asked to evaluate each other, the group and themselves.	(01) Trainees present their work on stage to introduce to the class the design intention, design ideas, functions and innovations of their work. Evaluate and self-reflect and summarise.	Trainees exercise their expression skills and through sharing, groups learn from each other and stimulate creative thinking. Facilitates self-reflection among the trainees.	(01) Evaluation form.

Source: Collated by this Research

3.1. Discovery Stage: Focus on Needs and Identify Problems

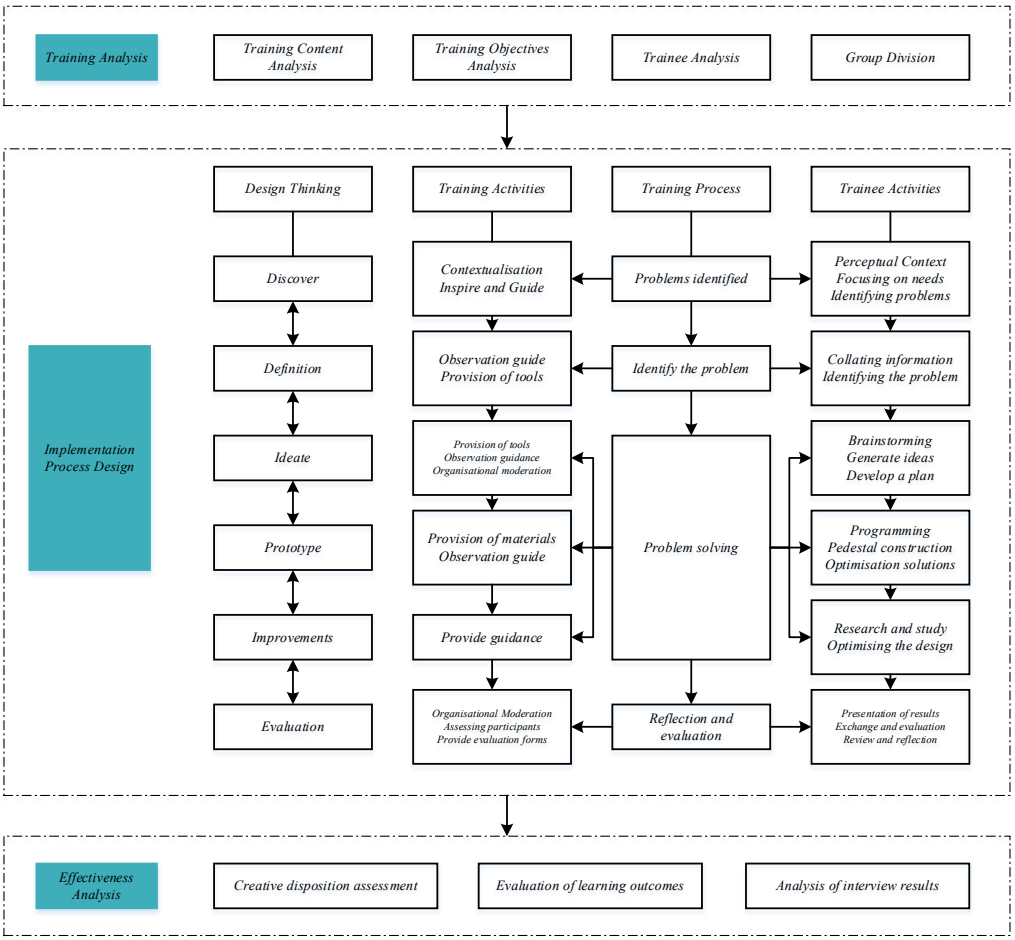
In the discovery stage, the coach can use digital resources to introduce real situations and at the same time use design thinking tools such as 5W1H forms and questionnaires to promote empathy among the trainees. This is a key aspect of design thinking, in which the trainees need to collect real user information and user needs and think from the perspective of the users. As the user groups are different, the problems identified by the trainees are also different. Therefore, the coach only needs to provoke the trainees to take the initiative to think and stimulate their curiosity, without making requirements on the specific functions of the project. The trainees have more room to play and choose when designing the project, boldly put forward ideas for the design of their works, challenge the unknown areas, learn new knowledge and be able to design according to the user needs they investigate They will be able to design the right product according to the needs of the users they survey.

3.2. Definition Stage: Organising Information & Defining the Problem

In the definition stage, participants need to collate and summarise the information they have collected before. In the process of summarisation, they need to exercise their logical thinking, analyse the causes of the problems by sharing with group members, and negotiate to determine the core problems to be solved, which should not be too many and should be operable, so that they can solve the problems within their capacity. After each group has identified the problems, the coach will provide guidance. At this stage, the coach needs to remind the trainees to always be "people-centred" and think from the user's perspective.

ISSN 2616-5902 Vol. 6, Issue 2: 37-46, DOI: 10.25236/AJBM.2024.060206

3.3. Conception Stage: Ideation and Development



Source: Collated by this Research

Figure 3: Design Thinking Oriented Team Training Model for GWM

During the conceptualisation stage, participants brainstorm and propose solutions to the problems identified in the definition stage. At this stage, participants are encouraged to generate more ideas, develop their thinking, give full play to their imagination and boldly propose ideas for the design of their work, using digital learning tools for assistance and presenting them in a mind map. After the group members have brainstormed, the ideas proposed by each member will be compared and selected for merit, and a final solution corresponding to each problem will be voted on and formulated. The solution includes the division of tasks and the electronic components to be used in the implementation of the project. At this stage, the team members need to work together as a team, playing to their strengths and complementing their weaknesses to ensure that the subsequent stages are carried out in an orderly manner. The coach has to play a moderating role, supervising and keeping track of the teams and making suggestions.

3.4. Prototyping Stage: Optimise the Solution, Produce the Prototype

In the prototype phase, participants are required to put into practice the solutions from the idea phase. During this process, team members follow a division of labour to efficiently write the program, build the hardware and test it. If problems are identified during practice, participants can iterate on the previous process to improve and refine it, and debug the successful hardware circuit and software program[24].

3.5. Improvement Stage: Research and Optimization of Design

At this stage, participants need to invite members of other groups to test their designed products, control the whole session, assign groups to be invited, when other group members come to the group to test their work, participants just tell the experiencers the steps they need to do and explain the operation

ISSN 2616-5902 Vol. 6, Issue 2: 37-46, DOI: 10.25236/AJBM.2024.060206

when they test the prototype, so as to let the experiencers find the problems that the group members did not find before, group members fill in the test record sheet to record the problems and correct them, participants experience the fun of project making and enhance the challenge in the process of finding challenges and solving them.

3.6. Evaluation Stage: Presentation and Evaluation of Results

Table 4: Assessment Form and Assessment Methodology of Team Training

Assessment Forms	Assessment Methods
Trainee Self-Assessment	Reflect on the role play, assigning objective marks for mastery of basic knowledge, basic skills, task completion, etc.
Coach's Comments	The trainee's work is evaluated and scored by the coaching team for creativity, functionality and appearance.
Intra-group Assessment	The team leader is responsible for judging the attitude, contribution and completion of tasks of the team members.
Inter-group Assessment	A representative from each group will comment on the work of the other groups in terms of appearance, creativity and functionality and assign marks.
Process Records	Points are assigned by the instructor based on the trainee's performance of the activity.
User Comments	Discounted scores based on platform messages, questionnaires, etc.

Source: Collated by this Research

In the evaluation stage (*as shown in Table 4*), each group presents its work on stage and introduces to the class the design intention, design ideas, functions and innovation points of the work. After the demonstration, the coach should guide the trainees to evaluate each other between groups and within groups, and complete the coach's evaluation of each group, during which the evaluation scale prepared by the coach in advance is used. In the evaluation session, trainees exercise their courage, clarify the correct operation method through the demonstration, exercise their expression ability and test the learning effect, and at the same time promote mutual learning among the groups, broaden the width of thinking and stimulate creative thinking. At the end of the inter-group evaluation and coach evaluation sessions, the coach needs to provide trainees with a self-evaluation questionnaire (*as shown in Table 5*), which involves an overall review and reflection of the work done by the trainees in this session, emphasising what the trainees have gained and focusing on the transformation of their thinking[25].

Table 5: Questionnaires of Team Training

No.	Interviews Subject	Interviews Questions
01	Coaches	Have you heard of design thinking before? Do you know anything about design thinking?
02		What do you think are the advantages and disadvantages of introducing design thinking into team training?
03		What do you think is the biggest difference between teaching in this way and the way you have taught before?
04		In what areas do you think the trainee's competencies have been improved by the end of this course?
05		Do you have any valuable comments or suggestions for introducing design thinking into G's team training?
06		Would you teach in this way in your subsequent teaching? Why?
07	Trainees	Did you enjoy the course?
08		Do you like this way of learning?
09		If so, what was your favourite part?
10		Which part of the event stood out to you?
11		How have the methods used by the instructor in this course contributed to the design of your work?
12		What is your biggest takeaway from this course?
13		How does the study of this course differ from the study of other courses?
14		Will you continue to study design thinking in the future?

Source: Collated by this Research

4. Conclusion

This research takes design thinking as a methodology, composes the design thinking model through the analysis of relevant literature, combines the principles and elements of teaching design for team training in GWM, and designs a design thinking-oriented course teaching design model. The teaching

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process consists of six stages: discovery stage: focus on needs and find problems; definition stage: collate information and clarify problems; conceptualisation stage: propose ideas and develop solutions; prototype stage: optimise solutions and create prototypes; improvement stage: investigate and research and optimise designs; evaluation stage: display results and exchange and evaluate each other. Each stage was designed with three projects from easy to difficult, and participants were provided with design thinking tools to assist their learning, reflecting on and optimising the teaching process during the three rounds of action research. At the end of the teaching practice, the effectiveness of the teaching and learning model was analysed through pre and post tests of creativity dispositions, learning outcomes, interviews with coaches and learners, and the teaching design model was revised and applied to the next team training activity in GWM.

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