

# Research of Three-Dimensional Spatial Performance is Applied to the Cultivation of Students' Innovation Ability

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## Abstract

By explaining what is design thinking, the six steps of the basic process of design thinking, which are understanding, observation, synthesis, creativity, prototype and test. In the process of improving design thinking, it emphasizes on the problem-solving centered team operation, and adopts the orderly improvement of eliminating levels and changing space. Finally, by analyzing the influence of 3D spatial performance research on students' design thinking, it proposes how to use 3D resources to improve students' design thinking ability in practice.

## Keywords

3D space design thinking, Innovation ability, Special training.

## 1. Introduction

Students' innovation ability includes a wide range of areas. This paper mainly focuses on the design thinking innovation ability of students majoring in environmental art design. First of all, what is design thinking? Design thinking is an efficient way to innovate. By analyzing problems and observing users, design thinking finds out the unmet needs of users and excavates the insights behind them. Based on insight, propose multiple creative solutions to solve problems, make "product prototypes" with ideas, and constantly verify, think, improve, iterate... seek innovative solutions that balance business, technology, and user needs. Tim Brown noted: "Design thinking is not only human-centered, but also a comprehensive, human-oriented, human-oriented thinking. This way should be integrated into all levels from business to society, where individuals and teams can use them to create breakthrough ideas and implement them in the real world."

Design thinking believes that the process of innovation should not be mysterious. Everyone is an innovator, and everyone can participate in innovative learning and practice according to specific rules and steps. Design thinking as a methodology contains an exhaustive set of toolkits.

### 1.1. Six steps of the basic process of design thinking

Design thinking focuses on the challenge of innovation, creates a good environment for innovation, and encourages innovation with standardized process. The basic process of design thinking consists of six steps: understanding, observation, synthesis, creativity, prototyping and testing. Design thinking focuses on the communication between team members. Each step requires statements and proposals from team members, and guides team members to continuously improve their communication skills in the process of work. Through process management, strengthen cross-border integration, and strengthen the ability to solve interdisciplinary problems.

Time control is also an innovative element particularly emphasized by design thinking. The time of each step is strictly controlled, and the continuous iteration cycle between different steps constitutes the most basic framework of design thinking innovation.

Understanding: to understand the connotation of the proposition, to define and analyze the proposition.

Observation: Use observation, experience, interview and other methods to in-depth understand the user.

Comprehensive: analyze user needs, mine user insight, and redefine the innovative proposition.

Creativity: Brainstorm around insights and needs, and the more ideas, the better.

Prototype: Choose an idea to create a touchable and sensitive innovative product prototype.

Test: observe user use and improve iteratively by collecting user feedback information.

## **1.2. The design process is a team operation centered on problem solving problems**

As Charles Ees says, if you're designing a chair, you need to communicate with the people who makes, buys and repair the chair. Therefore, design thinking emphasizes the challenge as the goal, the user-centered, and weakens the discipline division. In order to design a chair, we need a diverse team, dealing with all kinds of people.

The key to creativity is cooperation. According to the principles of interdisciplinary and interprofessional innovation team, the team members come from different fields such as engineering, design, marketing, innovation, media, and management. The interdisciplinary background of the team allows the team to think about problem solutions from multiple perspectives. Get some resources, skills, and ideas from the other partners.

All team members face the same task, asking others for advice, and even helping others with the job. For a common goal, the team members work together and encourage each other.

## **1.3. Cancel the hierarchy in the design process and advocate the changeable space**

In the process of design thinking, the identity of a teacher becomes a coach. The teaching team usually consists of three or four innovation coaches who enter the students' innovation group. The coach stood among the students, instead of speaking on the platform. The role of coach changes from "mentor" to "guide". Coach is responsible for creating an innovative atmosphere and promoting innovative ideas, rather than overreaching instead of students.

Design thinking emphasizes the openness of the space. Students build the group space freely and independently. They use whiteboards, movable tables and chairs, and auxiliary tools to create a comfortable space environment. The flexible space breaks the traditional teaching hierarchy concept, stimulates the atmosphere of innovation, and creates a multi-level creative connection among the team members.

In addition, the three-dimensional space performance covers a wide range of studies. This paper mainly focuses on the three-dimensional space materials, such as pictures, models, videos, animation and games. So how can the study of three-dimensional spatial performance help and improve students' design thinking and innovation ability? The following is mainly elaborated from the perspective of students' spatial understanding ability, design thinking process and space re-creation ability.

## 2. The role of three-dimensional spatial performance research on students' design thinking

### 2.1. Effectively improve students' understanding ability of space

The conversion between two-dimensional drawings and three-dimensional space requires a certain amount of spatial imagination ability. Three-dimensional space models, videos and pictures can help to accelerate the correctness and reference of students' understanding of space. Can let the students adjust the wrong understanding in time, save time and efficient, clear at a glance. Here, it is necessary to provide students with multi-dimensional three-dimensional space materials, and provide students with gradual unlocking steps according to the simple degree of degree, so as to guide students to think more and understand more. Do not give students all and complete materials at one time, which is not conducive to the development of students' exploration ability. The variety of three-dimensional space materials can be diversified, such as the simplest two-dimensional pictures, videos with roaming, to 3 D models that can be surrounded at will, to videos with explanation and analysis, and interesting modules with game attributes, and so on. All of these materials, in a certain order, let the students unlock one by one, one by one deep understanding. On the one hand, it complies with the law of thinking, on the other hand, it is gradually conducive to the development of exploration thinking, and contributes to the improvement of students' innovation ability.

### 2.2. Effectively improve students' design thinking level

①Guide students to ask questions and needs: The first step of design thinking is to clarify the problems and needs. Teachers can guide students to think about real-life problems and help them find potential needs from them. For example, students are encouraged to observe the surrounding environment and think about how to improve the quality of life, so as to think about the problem.

②Cultivate students' ability of observation and analysis: observation and analysis are the basic skills of design thinking. Teachers can set up various observation experiments and case analysis in class by stimulating students' interest. Through observation and analysis, students can obtain the background information of the problem and find the clues to solve the problem.

③Encouraging students to brainstorm and think creatively Brainstorm is an effective way to cultivate creative thinking. Teachers can organize students to brainstorm collectively to stimulate their creativity and imagination. In addition, teachers can also provide students with open questions and encourage them to give them personal thinking and creative solutions.

④Provide opportunities for practice and practical operation: the essence of design thinking is to solve practical problems, so it is necessary to provide students with opportunities for practice and practical operation. For example, students are arranged to design group projects in groups, so that they can experience the design process, learn and grow from it.

⑤ Cultivate students' teamwork ability: design thinking is a kind of interdisciplinary cooperative thinking, which requires teamwork in practice. Teachers can design cooperative projects, allowing students to work together in a team to solve problems, and cultivate their teamwork ability and cooperation skills of division of labor.

## 3. How to improve the design thinking?

We believe that the basic process of design thinking includes six steps: understanding, observation, synthesis, creativity, prototype and testing. So what role does the study of three-dimensional spatial performance do in these steps? In the progress of design thinking, how to introduce 3 D spatial expression resources to improve students' design thinking ability?

### 3.1. Understanding level

In the early stage of the design thinking work, we emphasize the innovation practice of "understanding" mainly has two levels of meaning, which contains both the design challenge given the problem and the understanding of the situation, also contains the understanding of people — is not only to understand the user, but also through the building project team between team members, group and group, between project participants and coaches. Although we describe the practice of design thinking innovation as a process containing multiple steps, and an understanding as the first step. But in fact, human-centered design is not a linear process, and for each specific project, the system is likely to diversify with complex changes. A more streamlined understanding of design thinking is to see it as a set of overlapping modules, rather than a continuous set of operational steps. For beginners, there are three modules to keep in mind: motivation, creativity, and implementation. Regardless of the design challenges in the future, the challenge part can be seen as problems or opportunities to find solutions; creativity is the process of generating, expanding and testing ideas; realization is the path to bring innovation from the project stage.

In terms of professionalism, we need to understand people and understand problems. Face the constraints, remain open, embrace the uncertainty, remain optimistic, and face the problems directly. In the process of understanding, for the three-dimensional space materials, the abstract space has concrete attributes, whether the indoor and outdoor space of the building, the geographical location, climate and wind direction can be more accurately displayed in front of students, reducing uncertainty and improving the accuracy of spatial positioning.

### 3.2. Observation level

Great designers are familiar with the tools, while great innovators understand the people. The real observation room explores the unknown world with an eye of innocence. Targeted research with specific environment and users; demonstrate empathy in the other person's perspective; break granted and find opportunities for innovation. Use observation, experience, interview and other multi-dimensional methods to observe the design objects. In this process, three-dimensional space resources can help designers to better establish design objects. After observing the object properties from multiple angles, it can be concrete, more intuitive, accurate, efficient and time-saving, so that students can quickly experience the local geographical space and cultural space in an immersive way.

### 3.3. Comprehensive level

Integration can also be called a definition, which is the abstraction of the collected information about users to obtain valuable innovation goals. The comprehensive goal is to make the design work clearer and more focused. Design thinking provides a series of tools and methods to support synthesis, so that designers can collect a lot of information in the process of user observation, check the scope of research, analyze user needs, extract insights from them, and establish the direction of further innovation. Integrating this brain-intensive activity is essential for designers to discover powerful insights. The text, images and video materials recorded by user interviews are loose, and sometimes some of the content seems contradictory, and the same problem has often been repeatedly considered by others or companies in the industry. As a crossover interloper, how can the design thinking team inject new blood and put forward better ideas here?

First, you need to repeat the information to the other members of the team. Because everyone has a division of labor in the process of research, and the interviewed users are different, sharing the harvest of observation and sharing the information of research will become the basis of the next collaborative work. Design thinking emphasizes the heavy use of instant

stickers and whiteboards at this stage, ensuring that each item is clear, concise and vivid, and displayed within reach in the workspace.

Secondly, we should start to sort out the classification information and list the user needs. After completing the previous information review, there are often dozens or even hundreds of instant posts on the whiteboard, and the information should be classified by different criteria. At the same time, we should find out the needs of users, which may be put forward by users or found by the investigators in the observation.

Three-dimensional space resources can simulate and analyze user needs, mine user insights, and redefine innovative propositions. Make the students feel more realistic.

### **3.4. Creative level:**

Creativity is the process of developing ideas for user insight. In the creative process, we will combine the inspiration obtained in the observation stage, focus on the core judgment obtained in the synthesis stage, stimulate each other in a short time, and output a variety of solutions.

The basic approach to brainstorming comes from the creative process pioneered by American George Osborne in 1938. Use creative thinking as a means to maximize the imagination of the innovation team. Creativity needs to open the mind, get exciting inspiration spark, good creative rules, methods, environment can promote the birth of more good ideas. One inspiration inspires another, and we are open to all the new ideas, and ultimately choose the most interesting, most successful, and most groundbreaking parts. The three-dimensional space model is the process of virtual simulation, insight, and customer needs into the project for brainstorming.

We need to stick to the theme and define the purpose; pursue quantity, delay judgment; teamwork and inspire each other; and jump outside the box.

### **3.5. Prototype level**

Dickens says in *Bleak House*: If you lack sincerity or are reluctant to do anything, even if you have great skill, you will not achieve anything. The prototype, as the name suggests, is the prototype of the final product. It's a process between ideas and a product. When we get a lot of creative concepts to put into production, make them visible and visible by quickly making cheap prototypes, and let others evaluate before you fall in love with your ideas. At this time, the use of three-dimensional space resources, virtual production of tangible innovative product prototype. There is a saying that "a thousand words can not be worth a picture". In the field of design thinking, we say that "thousands of pictures are not worth a prototype". On the one hand, making prototypes can help the design team to communicate the important product concepts clearly internally, making the design more solid and perfect. At the same time, they can also find out that those features are the most important, which are decorative and which can be removed.

### **3.6. Test level**

Edison once said, "I did not fail, I just found ten thousand unsuccessful ways." Design thinking is to find a valuable innovative solution in a very complex external situation, uncertain parameters, variables, a lot of opportunity space, which is the same as scientists exploring in the vast unknown real world, looking for a shining truth. Both need to have ideas, prototypes, and a lot of testing. We tested the effect through the 3 D virtual simulation exercise, and conducted the virtual advanced iteration. The process of iteration is the exercise of design creativity and practice. The intervention of virtual three-dimensional space makes the process more simple and portable, efficient and energy saving.

The improvement of design thinking ability can effectively improve students' creative ability through the simulation and iteration of virtual three-dimensional space.

#### 4. Methods to improve design thinking

So how to use the three-dimensional space performance, to effectively improve the students' creative ability? Combined with the specific learning situation of students, we give guidance according to the level of students. The sources of higher vocational students are divided into general high (good understanding and self-study ability), vocational high (slightly stronger practical ability), 3 + 2 (more lively personality) students. Due to the differences in learning level, autonomous ability and hands-on operation ability, they can take different forms of guidance through three-dimensional space resources.

In terms of school situation, first of all, the ratio of men and women basically shows the phenomenon of half of men and women, or even the majority of girls. This may be related to the more emotional characteristics of the art and design profession. Secondly, most of the students in our school are ethnic minority students from Zhejiang Province and a small part of northwest China, such as Tibetan and She minority. Usually, they belong to the object of school care, because there may be certain obstacles in language, some students have mediocre Chinese literature, and the examination will be difficult in all aspects, so they will be special care. These students can use the advantages of their own special region to introduce the customs and family culture of their hometown. This has some inspiration and reference function for students to improve the creativity of design thinking. Some of the information of these students can be three-dimensional resources, in order to better convey their own national culture and customs.

#### 5. Conclusion

Three-dimensional space resources have many benefits to improving students' design thinking ability. This paper expounds the concept of design thinking, the basic process of design thinking, through six steps to apply three-dimensional resources to the path to improve students' innovation ability, how to effectively improve, and the matters needing attention are made in-depth analysis and elaboration. It is hoped that the three-dimensional space resources can be effectively applied and practiced in more courses.

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