

# Research on the Design Framework of Future Classroom from the Perspective of Embodied Cognition

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## Abstract

With the continuous integration of technology into classroom teaching, traditional classrooms can no longer meet the needs of future social talent training, and the research on future classrooms has increasingly become a hot spot in the academic circle. Guided by the theory of embodied cognition, this paper, on the basis of summarizing the alienation of classroom teaching caused by traditional cognitive theory, analyzes that the future classroom of embodied cognition theory has the generative nature of teaching objectives, the adaptability of teaching content and teaching methods, and According to the spt framework, the embodiment strategy of the future classroom is explored from the three aspects of space, technology and pedagogy, so as to improve students' learning participation.

## Keywords

Future classroom, Embodied cognition, Embodiment.

## 1. Introduction

With the rapid development of science and technology, emerging technologies based on artificial intelligence, big data and VR have been widely used in educational practice, injecting many new elements into the development of learning space, and contributing to the realization of precision, efficiency and individuality in education. offers the possibility. However, although the intervention of technology can make education more flexible and effective, the traditional classroom forms of dogma, pattern, simplification and static are still common phenomena, and teaching concepts and teaching methods can no longer match the smart teaching environment. Therefore, we urgently need Changing and reimagining the classroom of the future[1]

In recent years, the rise of cognitive science has caused changes in the concept of classroom learning environment, which mainly includes two research paradigms: traditional cognition and embodied cognition. Embodied cognition emphasizes the participation of the body in the cognitive process. With the support of technology, it enables students to integrate their "body" into the classroom, thereby improving students' learning engagement in courses and promoting students' meaningful learning. Therefore, guided by the theory of embodied cognition, this research re-examines the essence of smart learning space, analyzes the law of educational development, reconstructs the system of embodied cognitive learning environment, and proposes embodied teaching strategies in smart learning space, so as to improve students' learning effectiveness.

## 2. Disembodied Cognition: The Dilemma of Classroom Teaching Under Traditional Cognitive Theory

Cognition refers to the process of acquiring knowledge through complex mental activities. Cognitive function is the intelligent processing process of body cognition and knowledge acquisition[2]. In traditional cognition theory, learning mainly takes place "above the neck" of a person and has nothing to do with the body. The brain completes the input, processing and

output of information[3] . It is a learning model based on information processing based on empiricism and rationality on the basis of doctrine Empiricism believes that all knowledge comes from sensory experience, which is external and objective, and learning is a passive acceptance process. In the teaching situation based on empirical design, students are often passive recipients of knowledge, resulting in the separation of consciousness from the body, lack of attention , and low participation .

### **2.1. The loss of student subjectivity**

Looking back on the history of education for thousands of years, in the Chinese education paradigm, teachers have always firmly controlled the dominant position of teaching, although under the influence of modern educational ideas, the status of " student-centered" education has been slowly reversed. However, the problem of dislocation caused by students obeying the teacher and the subject's suppression of the body during the interaction process has always existed. When teachers design the teaching situation, they simply think that the teaching situation is the link of teachers presenting the situation, explaining the situation, discussing and communicating. Teachers occupy the dominant position in the situation, and design situations that can regulate and control the students' bodies according to their own ideas. This is a kind of suppression of mind to body, and it is a manifestation of the dislocation of the subject.

### **2.2. Presupposition of Teaching Objectives**

In education and teaching, the all-round development of students is the ultimate goal of education, and the classroom teaching system should be open and generative. In the traditional cognitive theory, the classroom teaching situation is regarded as a mechanical system without any vitality, closed and without evolutionary ability.[4] In the process of creating teaching situations, teachers design teaching content, teaching methods and teaching situations according to the preset teaching objectives. The whole teaching process has preset attributes, and teachers carry out teaching according to the designed teaching design. This rigid teaching mode seems to make it easy for students to master knowledge, but it actually limits the development of students' divergent and diverse thinking.

### **2.3. The teaching situation loses its "truth"**

In classroom teaching, a good teaching situation is to regard students as a part of the system, take students as participants in problem solving, and form a multi-faceted development of students' knowledge, concepts and emotions through certain training. "Truth" in the teaching situation includes procedural truth, social truth and practical truth[5] .Procedural authenticity means that the teaching content in the teaching situation is logically clear, and the teaching design is smooth and natural; social authenticity means that the teaching content is close to the real social life, not divorced from the reality of life; practical authenticity means that the teaching situation requires the full participation of students.

However, in classroom teaching, we often find that the teaching situation created by teachers seriously lacks social reality and practical reality. Teachers usually overemphasize the knowledge of the teaching situation, but ignore the social nature of the entire teaching content, and underestimate the students' physical participate. Such teaching situations are mostly a process of knowledge transfer. Teachers hope to instill more knowledge in the shortest time, lacking the practicality of physical participation, and the knowledge learned by students is only at the theoretical level, and they cannot learn the skills of problem solving ability .

### **3. Embodied Learning Situations: New Trends in the Classroom of the Future**

#### **3.1. Embodied cognition theory**

Embodied cognition, also known as embodied cognition and embodied cognition[6], is based on Piaget's cognition theory, Gagne's information processing theory and Vigos's social and cultural views, and is used to explain The theory that humans acquire cognition through physical interaction with the outside world.[7] Embodied cognition believes that cognition cannot exist without the body, and it originates from the interaction between the brain and the sensory system, as well as the body and the external environment.[8] Cognition is mainly formed through the interactive experience and activity forms of various sense organs in the environment.[9] Therefore, in a specific teaching situation, cognition, body and environment are nested and inseparable. Cognition exists in the brain, the brain exists in the body, and the body is attached to the environment.[10]

#### **3.2. Embodied cognitive environment**

Embodied cognition emphasizes the monism of body and mind, and mind-matter. Its essence is to regard the classroom as a whole with opportunities, a learning situation where the body and mind are integrated and the subject and the object are integrated. It is mainly composed of four aspects: physical environment, technical environment, emotional environment and social environment: (1) The physical environment is the space for learners to interact with the surrounding environment, and is the premise of teaching activities, color, lighting, etc. (2) The technical environment is an important tool used to support learners' learning, including learning materials, video resources, cognitive tools, etc.; (3) The social environment is the sum of all kinds of relationships in the teaching situation, including teacher-student relationship, student-student relationship, relationship between teacher-student and technology, specifically manifested as high interaction in the learning process; (4) Emotional environment is the thinking mode, value orientation, learning habits and other elements of teachers and learners.

#### **3.3. Embodied cognitive environment characteristics**

Under the traditional cognitive theory, teachers occupy an absolute dominant position in teaching, and students can only be passive recipients. The high podium and fixed tables and chairs restrict students' body and speech too much, ignoring the role of the body in learning[11], the classroom often becomes "full of classrooms", and students' learning initiative and participation are not high. The embodied cognitive environment emphasizes the value and active participation of the body in teaching activities, pays more attention to teacher-student interaction and student-student interaction, guides learners to actively participate in learning, and realizes whole-hearted learning.[12]

##### **3.3.1. The generative nature of teaching objectives**

Varela and others pointed out in the classic book *Embodied Mind: The Discipline of Cognition and Human Experience*: "Cognition is not a representation of a pre-given mind to a pre-given world." The generation of worlds and minds on the historical basis of the multiplicity of roles performed'. [13] Embodied cognition believes that education is a continuous process of dynamic development under the interaction of the teacher-student community, which cannot be presupposed. The fact that the teaching goal cannot be presupposed here does not mean that the teaching goal is free and arbitrary. On the contrary, the generative nature of educational goals means that teachers and students guide students to explore independently for a specific goal on the basis of giving full play to students' learning autonomy generation.

### 3.3.2. Contextuality of learning content

The theory of embodied cognition believes that human cognition is situational and cannot be separated from the interaction between the body and the surrounding environment[14], only knowledge rooted in the context of the situation can become knowledge that is easily absorbed by students. With the continuous development of technology, modern technologies represented by artificial intelligence and virtual reality can provide an immersive learning situation with suitable physical environment, rich learning resources and dynamic adjustment, so that the teaching content can be close to real life and make up for the real environment. The physical situation that cannot be realized in the middle school brings a good learning experience to the students. At the same time, a good learning situation can enhance students' strong sense of presence in learning, so that students' bodies can be integrated into the whole teaching situation, forming a situation where there is me in you and you in me, and the participation of students in learning can be improved.

### 3.3.3. Adaptability of teaching methods

Traditional classroom teaching is preset, that is, teaching content, teaching methods, teaching content, teaching tools, etc. have been designed in advance, and classroom teaching is carried out step by step and rigidly, without taking students' learning experience into consideration. The embodied learning environment can be adjusted according to the learning status of the students. Cognition exists in the body. In the continuous interaction between the body and the environment, the learning situation can change according to the learning style, learning behavior, learning needs and cognitive characteristics of different learners, providing various real-time class data to teachers. Teachers provide personalized teaching by changing teaching processes, replacing teaching tools, supplementing teaching materials and other teaching methods, completely releasing students' bodies, and promoting deep participation and integration between students and the environment.

## 4. Embodied Teaching Strategies Based on the PST Framework

For the study of learning space, Professor D. Radcliffe of the University of Queensland proposed the pedagogy-space-technology framework in 2009[15], that is, pedagogy, space and technology are mutually complementary and mutually reinforcing, and pedagogy is a combination of space and technology. On the basis of application, space provides physical guarantee for pedagogy and embeds information technology in it. Technology promotes the effectiveness of pedagogy and broadens the scope of learning space. The future classroom does not mean the technological innovation of traditional classrooms. As a highly interactive and personalized learning situation, it is necessary to comprehensively consider the adaptability and embodiment of teaching methods, space and technology. To this end, the design of future classrooms can be considered from the following aspects.

### 4.1. Space design should pay attention to students as the center

The development of students is the ultimate goal of education, and everything is student-centered. This is one of the key features that distinguish embodied classrooms from traditional classrooms. Therefore, the design of the space must fully consider the needs of students for learning. Studies in related fields of environmental psychology have shown that environmental variables such as sound, light, and temperature have varying degrees of effects and influences on people's work efficiency, stress, and emotional states.[16] When designing the space, integrate the concept of "openness and freedom", fully consider factors such as tables and chairs, temperature and humidity, light and wall color, and create a comfortable, bright, environmentally friendly and healthy learning environment to satisfy the psychology of teachers and students needs. At the same time, the design of the space also needs to meet the

functional needs of teachers and students in teaching activities. In terms of layout, a divided block structure can be adopted, that is, split screens are built around the classroom to meet the disadvantages of students in the back row who cannot see the blackboard clearly.

#### **4.2. The use of technology should focus on the integration of the body's sensory system**

In classroom teaching, students' perception, classroom activities and learning environment are unified and connected with each other. To maximize students' learning benefits, students are embodied in the classroom situation, participate in course teaching, and experience and practice knowledge. The body is a bridge between cognition and the environment. People's cognition of the body includes touch, pain, hearing, smell and vision. Therefore, it is necessary to use technology to integrate and magnify various sensory organs to promote students' cognitive abilities. The future classroom is a new teaching space that integrates multiple new technologies such as multi-screen interactive technology, virtual reality technology, and artificial intelligence. These technologies need to present teaching content more intuitively, visualize abstract knowledge, and make tacit knowledge explicit. Practical theoretical knowledge, explicit perceptual thinking, multi-angle and multi-method presentation of knowledge, as much as possible to promote the acquisition and reflection of students' direct experience, combine the acquired experience with the transformation experience, and realize the spiral of the learning process.

#### **4.3. The Design of Teaching Method Should Pay Attention to the Interaction of Multiple Subjects**

In the classroom teaching situation, teachers, students and technology can be regarded as an open, inclusive and free educational ecosystem, and they are a learning community with common goals, concepts and beliefs. Therefore, the relationship between teachers and students, and between students and students is the key to realizing highly interactive learning. In designing teaching situations, we must first weaken the dominant position of teachers and establish a democratic and equal teacher-student relationship. Teachers and students are no longer The relationship between subject and object, both teachers and students are both the object of cognition and the subject of cognition, and both sides complete the teaching practice tasks in a relaxed and pleasant atmosphere; secondly, according to the teaching content, create a highly interactive teaching situation to promote the relationship between teachers and students, students and students. The exchange and interaction among them form an ecological learning community of symbiosis and coexistence. Finally, fully consider students' physical and psychological factors, respect students' subjective value, try to meet students' individual needs, enhance students' sense of belonging, collective sense and sense of accomplishment, and build a friendly, open and interactive classroom learning Situation, enhance the vitality of classroom teaching.

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