# Reform of Intelligent Classroom based on "Embodied Cognition" Model

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**Abstract:** On the basis of fully discerning the core meaning of the theory of "embodied cognition" and its underlying mechanism, this paper probes into the drawbacks of contemporary education mode, and explains the future iteration direction of teaching mode. Based on this cognitive framework, the advantages and disadvantages of the teaching environment of Southeast University are judged, and the intelligent classroom of Southeast University is reformed.

**Keywords:** Embodied cognition; Education; Intelligent classroom; Reform

## 1. Introduction

Influenced by Confucianism, China's traditional education system has evolved from private schools and academies to today's university education system. Although the forms are different, there is a teaching-centered passive learning kernel in the low-level logic. In the past, when information was scarce and knowledge was slow to update, this form of education could be matched with it, reflecting its own advantages in communication.

## 2. The History and Evolution of the Intelligent Classroom

However, in the information age, almost all industries are facing huge impact and disruption. Especially in the current internet era, the traditional teaching mode of teachers' speaking and students' listening is disintegrating. The renewal and acquisition of knowledge have become extremely convenient, and the new generation's demand for self-awakening and free development has become increasingly strong. The structural change of the form of education is bound to be a dynamic change in Chinese education. Autonomic learning, as the center of the incentive education, is changing from the tendency to the popularity.

The concept of intelligent classroom was introduced in western developed countries as early as 2003. Compared with the exploration in intelligent classroom of universities in China in recent years, the biggest difference lies in that the reforms of foreign universities attach more importance to the influence of spatial scale and environmental color on human behavior and emotion. In recent years, the efforts of colleges and universities in China have focused more on the internet technology and upgrading of equipments, the race of equipments and systems is in full swing among the universities.

Therefore, as the internal demands of contemporary Chinese university information development to a certain stage, the reform of intelligent classroom should starts from actual needs, based on the healthy and benign cognitive concept, it reconstructs the classroom environment to create a new type of classroom environment suitable for students' learning and teachers' teaching, so that the Chinese intelligent classroom can truly support a variety of learning scenes such as teaching, discussion, sharing and exploration in a broader and richer level.

## 3. Embodied Cognition Model

### 3.1. The opposition between embodied cognition theory and traditional cognition theory

In 1979, the psychologist James j. Gibson put forward the theory of perceptual ecology, on this basis, the theory of embodied cognition was developed. The core of this theory is that cognition as a result is closely related to people's physical condition and the situation of the space and time in which the body is located. Unlike traditional cognitive psychology, which holds that cognition is separate from the body and its environment, embodied cognition holds that the mind is locked in the body. Cognition is the cognition of the body, and the mind is the mind of the body. Without the body and its environment, cognition and mind cannot exist. This view of cognition largely improves the traditional psychology's neglect of the relationship between the body and the environment

With the wide spread of embodied cognition theory, scientists have become increasingly aware of the important role of the body and its environment in mental activity. Descartes' "cogito, therefore I am" is turning gradually to "I do, therefore I am". This shift will inevitably have a comprehensive impact on disciplines such as philosophy, psychology, neuroscience, medicine, linguistics, ethics and pedagogy.

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*International Journal of Intelligent Information and Management Science*
*ISSN: 2307-0692, Volume 8, Issue 3, June, 2019*

### 3.2. The enlightenment of embodied cognition model to educational mode

The psychologist Arter•grunberg devoted his life to studying how people learn. He had the children read some sentences, for example, "goats eat hay", and some of the children read aloud and were asked to act out the sentences with props, while the others just read sentences aloud over and over again. As a result, the children who acted out the sentences improved their understanding of the story by 50 percent, suggesting that physical involvement improve the children's ability to learn indeed. The relationship between body and creativity is equally striking. Related experiments have also confirmed that a moving body is more likely to be inspired than a stationary body. That's why innovative companies like Google and Apple have dedicated sports zones for their employees.

The reason behind this phenomenon can be explained by biologist Donald hebb's great discovery in 1949. He found that brain cells that were active multiple times at the same time were more likely to connect. In other words, the activity of one neuron activates the activity of another, and since they stimulate each other many times, some changes in growth or metabolism occur. These changes run through the connections between cells, allowing them to more efficiently activate each other, and this phenomenon is called "Hebbian learning". This actually explains embodied cognition theory from the cellular scale, and also brings a lot of enl.

The mainstream of modern education, both east and west, is mostly static education. Students are expected to sit quietly and learn primarily through the mind. However, when we understand embodied cognition theory, we should think about how to change the teaching environment to force the innovation of teaching methods. The reform of intelligent classroom in Southeast University is based on such a brand new cognitive model.

## 4. Intelligent Classroom Renovation Project in Southeast University

### 4.1. Status analysis

By the standards of "intelligent classroom", the current teaching environment of Southeast University has the following deficiencies: As a key node to enter the teaching environment from the external environment, the entrance of the current situation fails to complete the mission of better space conversion, and the placement of sales machines is slightly disordered; As an important grey space inside the building, the main interface of the corridor is decorated in a way that is too simple and does not differentiate it from the classroom space. The classroom lacks the necessary intelligent equipment to meet the teaching needs of the intelligent classroom; the forms of tables and chairs as well as the arrangement of tables

and chairs are not diverse enough to meet the needs of flexible teaching methods in the intelligent classroom; Due to the large east-west space in the classrooms, the east-west arrangement of desks is not conducive to students who sitting at the back to receive class information; As a special node in the main passageway connecting the upper and lower floors, the space properties of the cleaning tools room are not well stimulated. The way of dealing with the space such as the teacher's lounge and toilet is also relatively moderate, and there is still a large room for improvement in the aspects of plane layout, facade decoration and so on (as shown in Figure 1).

### 4.2. Overall design idea

While reinterpreting the existing space, smart devices are moderately embedded, thus optimize the teaching environment and trigger the occurrence mechanism of embodied cognition. Combine traditional top-down knowledge dissemination with bottom-up teaching interaction, and improve the transmission efficiency and the receiving efficiency of knowledge. The specific ending point is "interaction", and it is reflected in two aspects: first, redefine the cleaning tool room on each floor and make it an intelligent experience space. Try to combine the intelligent equipment to inspire students to find themselves through intelligent devices, forming a humanistic and intelligent interactive space. Second, take the large classroom and small classroom as the center, and consider the corridor and other spaces comprehensively, forming the interactive space of artificial intelligence.

The realization methods include: by optimizing the layout of the classroom, increasing more types of tables and chairs and enriching the arrangement of tables and chairs and other ways, increase the possibility of visual interaction between users; through the optimization of space interface and the improvement of furniture quality, users can keep a longer focus in the space. Different theme tones are set for each floor to reflect changes in material and color. The change of color is used as a metaphor for the change of seasons, thus superimposing the dimension of time in the scheme, while improving the environmental recognition, and it also creates a harmonious and pleasant color atmosphere (as shown in Figure 2).

### 4.3. Main space design scheme

The large classroom, which can accommodate 40 people, has a flexible layout. A relatively independent discussion group can be formed around each desk. Each group is equipped with a separate monitor to support the development of multi-screen interactive learning mode. Intelligent fresh air system is added to the space. Walls on the east and west sides use acoustical board to weaken echoes produced by too much space. Condole top uses the form of plasterboard plus strip luminous panel to make the space full of modern feeling. The large classroom,

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*International Journal of Intelligent Information and Management Science*
*ISSN: 2307-0692, Volume 8, Issue 3, June, 2019*

which can accommodate 60 people, has a regular layout and high utilization of space. At the same time the space can assume the role of standardized examination room, and it can be used as the examination room for 45 people.

The space is decorated in the same way as that of a 60-person classroom, but it reflects change on qualitative color.



| A large classroom | B small classroom | C teacher's lounge | D entrance space | E toilet | F Cleaning tool room |

An open entrance space on the ground floor | The corridor space | A large classroom | stairway space | A small classroom

teacher's lounge | toilet | west side of entrance | east side of entrance | vacant or unoccupied spaces

**Figure 1. The main interface of the corridor**

Theme colors of different floor space scheme ideas



Theme tone of the fifth floor: warm grey

Theme tone of the fourth floor: blue

Theme tone of the third floor: purple

Theme tone of the second floor: yellow

Theme tone of the first floor: green

Space color profile on the first floor of teaching building
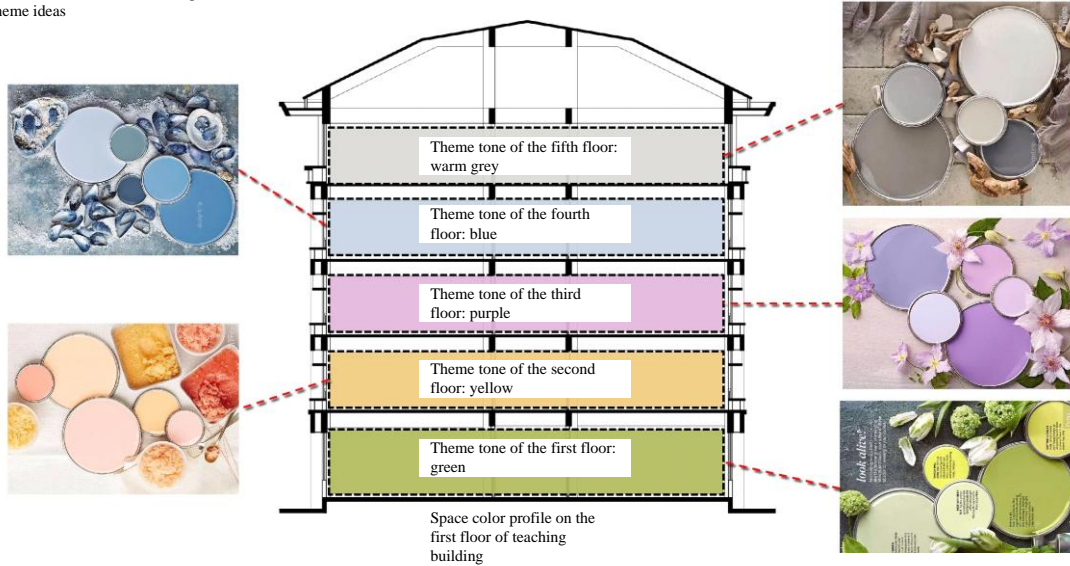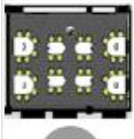
**Figure 2. Different color for each floor**

Small multi-screen interactive classroom can accommodate 24 people. Semi-circular desks are used to form several relatively independent groups, and each group is equipped with a display system. It can be used as an interactive learning classroom for discussion. On the basis of satisfying the teaching function, the space design presents a new type of information and interactive classroom through the combination of color and furniture.

The ground of corridor uses grey, blue rubber floor, and metope is given priority to white. At the entrance of the

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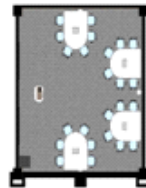*ISSN: 2307-0692, Volume 8, Issue 3, June, 2019*

classroom, the solar term colors corresponding to each building are used on the walls, doors and floors to connect the three faces into a whole, creating an interactive space of change. Considering the influence of the fresh air system on the floor height, the ceiling is hollowed out to form a virtual contrast with the gypsum board on the top of the classroom. At the entrance of each classroom,

an electronic class board is set to display the basic information of the corresponding classroom.

The color of solar term corresponding to each floor is applied on the door of toilet and clapboard, the ground of toilet uses grey rubber floor, and metope adopts white dumb smooth wall brick as a whole, building a relaxed and clean lavatory environment(as shown in figure 3)



Description of design：
In this design, the large classroom, which can accommodate 40 people, has a flexible layout. A relatively independent discussion group can be formed around each desk. Each group is equipped with a separate monitor to support the development of multi-screen interactive learning mode. Intelligent fresh air system is added to the space. Wall on the east and west sides use acoustical board to weaken echoes in large space. Condole top uses the form of plasterboard plus strip luminous panel, and the space is concise and effective.

(A)



Description of design：
In this design, the large classroom, which can accommodate 60 people, has a regular layout and high utilization of space. At the same time the space can assume the role of standardized examination room, and it can be used as the examination room for 45 people. The space is decorated in the same way as that of a 60-person classroom, but it reflects change on qualitative color.

(B)



Description of design：
Small multi-screen interactive classroom can accommodate 24 people. Semi-circular desks are used to form several relatively independent groups, and each group is equipped with a display system. It can be used as an interactive learning classroom for discussion.
On the basis of satisfying the teaching function, the space design presents a new type of information, interactive and stylish classroom through the combination of color and furniture.

(C)



Description of design：
The ground floor uses grey, blue rubber floor, and metope is given priority to white. The whole style is concise and easy. At the entrance of the classroom, the corresponding solar term color of each building is decorated on the wall, door and floor, connecting the three faces into a whole, creating an interactive space of change.
Considering the influence of the fresh air system on the floor height, the ceiling is hollowed out to constitute changing and vacant corridor atmosphere, contrast with the top of the classroom.
At the entrance of each classroom, an electronic class board is set to display the information of classroom.

(D)

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*International Journal of Intelligent Information and Management Science*
*ISSN: 2307-0692, Volume 8, Issue 3, June, 2019*

Description of design：
The ground is grey rubber floor, and the wall is light green, sound-absorbing board is used on one side of the wall, and the ceiling is white gypsum board, LED lamp belt, and down lamp is set in the middle.
Glass art installations are installed on the display walls. The colors of the lounge on different floors match those of the classrooms on that floor.
The circle chair has a quiet and private function.

(E)

Description of design：
The original tea room is dimly lit and facilities are old, and now the tea room and corridor wall get through, so the light can shine in directly. Glass partition is used to enclose the space around, and it appears transparent and neat, and it has more sense of modern.

(F)

**Figure 3. Different spatial designs (A-F)**

On the choice of adornment material, energy conservation and environmental protection as the principle, on the premise of ensuring material properties, try to choose environmentally friendly and recyclable decorative materials with low energy consumption (as shown in figure 4).
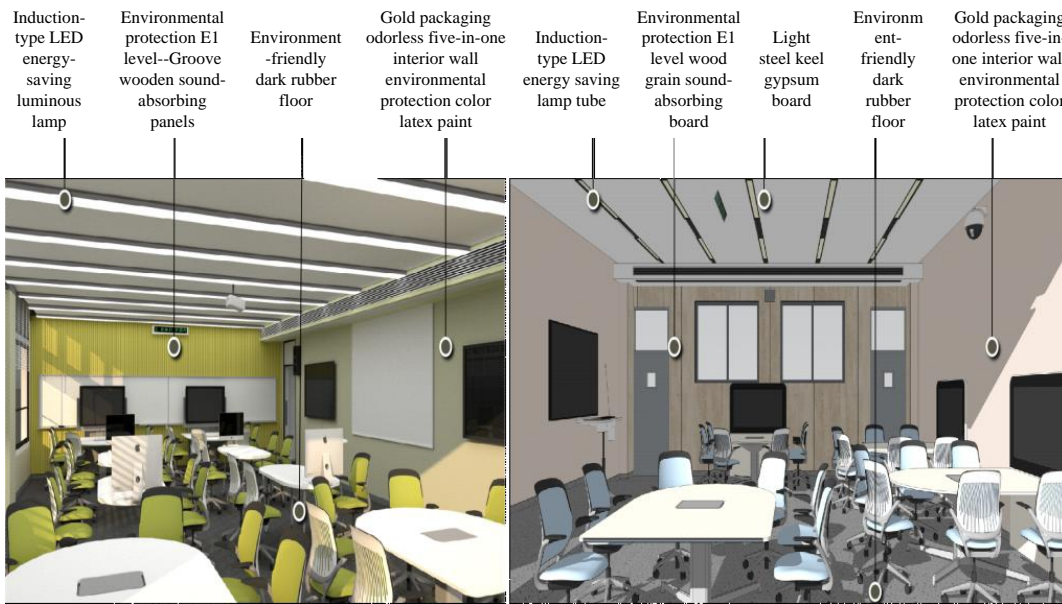


**Figure 4. The choice of adornment material**

### 4.4. The allocation of space intelligent equipment

The intelligent device involved in this scheme includes teaching system (newly added), LED indoor display system (newly added), electronic class board (newly added,

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*International Journal of Intelligent Information and Management Science*
*ISSN: 2307-0692, Volume 8, Issue 3, June, 2019*

installed out the classroom), asset management system, lighting control system (newly added), air conditioning control system (perfect existing equipment), fresh air ventilation system (newly added), video system (perfect existing equipment). The introduction of intelligent devices is demand-oriented and it follows the principle of reasonableness and moderation, in order to avoid invalid excessive stacking (as shown in figure 5).
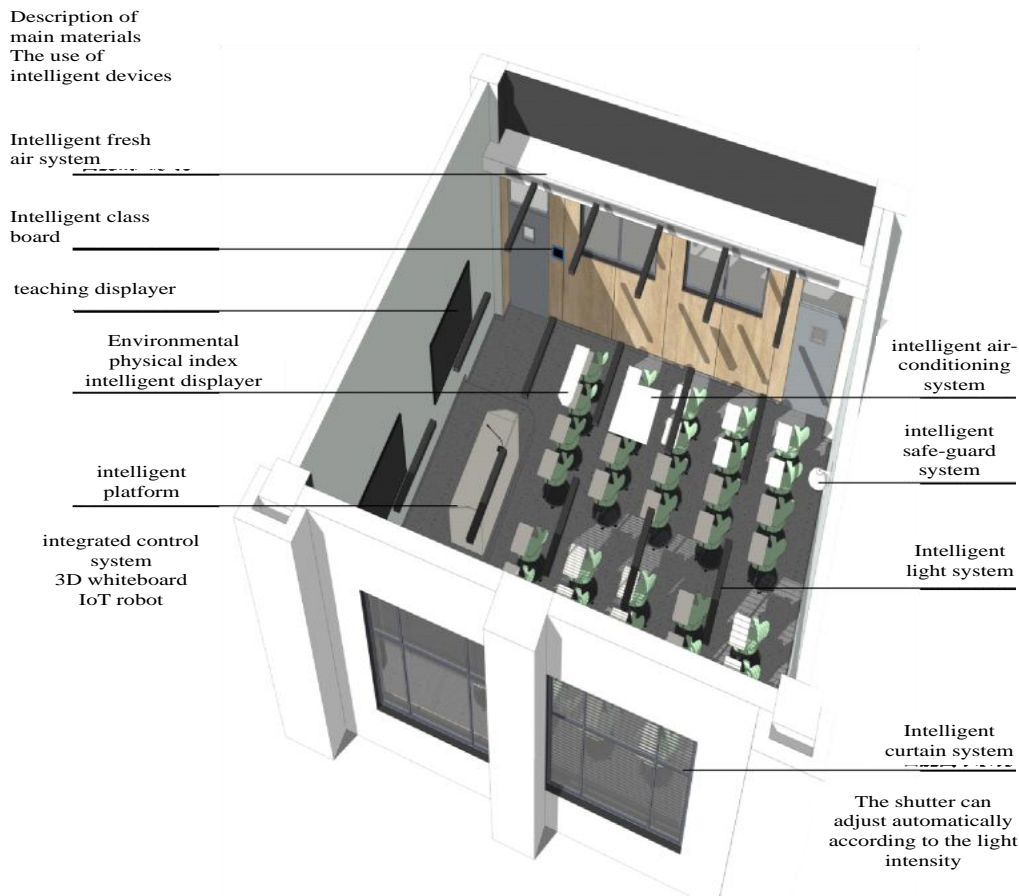


**Figure 5. The intelligent device**

## 5. Conclusions

Based on embodied cognition theory, the reform of intelligent classroom can carry out revolving around the flexibility and diversity of the classroom layout, rational use of intelligent devices and comfortable of spatial decoration, and from these aspects improve the environment that user in comprehensively, thus improve people's spiritual level (such as attention, mental activity and so on) from the opposite, and then improve the efficiency of learning.

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