The Influence of Situational Teaching Model on Classroom Teaching Effect

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Abstract: The influence of situational teaching models on classroom teachingisstudied in this paper. The principles of the establishment of the situational teaching model are analyzed. On this basis, the general operation framework of the situational teaching model is established. From the three parts of learning resources, learning targets and learning objects, the knowledge storage structure is established through Java+UML construction technology to realize scenario import. For the purpose of accurately modeling virtual objects, virtual reality scenes are established, and scenario exercises are realized through virtual reality technology. The image registration is completed by ICP method, and the image files of different perspectives are merged into a complete three-dimensional image by using the open source software Vrip-pack. The texture mapping is realized by the local spherical texture algorithm, and the bilinear interpolation is used to smooth out the sawtooth between the output pixels of the screen. The realization process of the instantiation technology is given, and the 3D model is established. The experimental results show that the situational teaching model can improve students'learning interest and achievement, and has a positive impact on classroom teaching effect.

1. Introduction

In traditional mathematics classroom teaching, teachers unilaterally emphasize formal logic derivation, pay less attention to the display of knowledge discovery process and intuitive background. In the eyes of students, knowledge has become a dull accumulation of theories and exercises [1]. At present, a new round of curriculum reform is actively, steadily and gradually advancing. The new curriculum advocates that "Teachers should pay attention to creating situations, starting from specific examples, to show the occurrence and development of knowledge, so that students can find problems, put forward problems, and experience the discovery and creation of knowledge". Therefore, it is undoubtedly an important issue that we should study deeply how to create a situation and how to create a situation to meet the requirements of the new curriculum reform on the quality of mathematics teachers [2].

The so-called "Situational teaching" is a teaching mode in which teachers create specific teaching scenes according to teaching objectives and teaching contents, arouse students' learning emotions and combine cognitive activities with emotional activities [3]. Specifically, based on students'life experience and cognitive level, teachers create simulated life situations and thinking situations according to curriculum standards, with the help of textbooks and pictures, words, audio-visual and other situational materials, and guide students to conduct independent, cooperative and inquiry learning, so as to acquire knowledge and skills in the situation, master the process and methods of cultivating emotions, attitudes and values. Constructivist learning theory holds that the learning process is not a passive acceptance of knowledge by learners, but a process of active knowledge construction. Meaning construction is the purpose of learning, which depends on students'self-consciousness and initiative. The role of teachers and the external environment is to help and promote students' meaning construction [4]. Modern teaching theory points out that the

teaching process is a process of communication, interaction and collaborative development between teachers and students. Communication means dialogue and participation, which means mutual construction. In the meantime, it must rely on certain situations [5].

In this paper, situational teaching modelis establishedto study the influence of situational teaching model on classroom teaching effect. The results show that situational teaching model has a positive impact on classroom teaching effect.

2. Methods

2.1. The Principles of Establishing Situational Teaching Models

Situational teaching model should conform to students' cognitive structure principle, objective authenticity principle, selectivity principle, attractiveness principle, and integrity principle. The following is a detailed analysis.

2.1.1. Students' Cognitive Structure Principle

Situational modeling, collaboration, conversation and meaning construction constitute the four elements of learning environment. It is the first content of classroom teaching activities and the feeling of students' first intervention in classroom teaching. Therefore, its success not only directly affects the development of other teaching design links, but also causes the students to pay close attention to the subject of learning, and then produces to explore due to cognitive dissatisfaction and lack of initiative. The starting point of setting up scenario model is based on the following two points: one is to grasp the teaching content; the other is to analyze the students' cognitive structure [6]. Cognitive psychology holds that human cognitive activities develop into a structure in a certain order. Therefore, in order to carry out instructional design, we should carefully analyze the cognitive structure of students. This kind of analysis should not be abstract, but should be concrete and multi-faceted. It includes the process of students' perception, memory, language, thinking, problem solving and so on. It should also include the factors of students' learning motivation, experience, and emotion and so on. On the basis of comprehensive analysis, it should look for the learning theme and students' cognitive structure. On the basis of comprehensive analysis, it should find an effective combination of learning themes and students' cognitive structure, and promote students' cognitive psychology to assimilate and adapt to new knowledge with the most appropriate external stimuli, to complete the construction of new meaning.

2.1.2. Objective Truth Principle

Constructivist learning theory emphasizes the creation of real scenes, and the creation of vivid social culture and natural scenes by various means. This is because truth is not only of cognitive value, but also because the real scene is the closest to the students'life experience. It can mobilize all their feelings and past life experience to explore and discover problems, and only the questions raised in the real scene are the most challenging and pertinent. It is better able to show its value and practical significance to solve the problems. In a sense, the authenticity degree of the creation of the situation also determines the degree of students'cognition of the learning theme and meaning construction. Therefore, when we create scenarios, we should be realistic and true to the effect of each kind of media, the process of scenario unfolding, the use of details and the emergence of problem scenarios. Even for some special content, we should be as close as possible to the truth.

2.1.3. Selectivity Principle

Constructivism holds that the existence of the world is objective, but the understanding and meaning of the world is determined by each person himself, and is constructed and explained by them according to their own experience. Because everyone's experience is diverse or different, people's interpretation and construction of objective is also diverse. Starting from the theory of constructivism, situational model should be built around the learning theme, to provide a variety of scenarios, in different scenarios or even the opposite scenarios from different perspectives. In different scenarios, even in the opposite situation, the students themselves choose the scenarios to

enter and complete the construction of meaning in their own way. As we all know, the existence of one side of the contradiction is based on the existence of the other side as the premise. There is no comparison, there is no discrimination. It needs to let the students understand the current learning of new knowledge. Teachers should not confine their students'horizons to a given understanding, but should place their learning themes in a broader context, provide rich and vivid learning resources in a larger space, and provide powerful tools for discovering problems, exploring knowledge and expressing opinions, so as to cultivate students' perception, creativity and imagination.

2.1.4. Attraction Principle

Psychological research has shown that people's perception of the world always pays attention to the latest information first, because they are stimulating and attractive. Similarly, students'interest in learning depends on whether it can provide new information. Scenario creation should be innovative and changeable. It should not only connect the situation with students'life experience, but also stimulate them with new information. New situations appear in unexpected places, and new questions are raised. The content of the situation, the use of the media, and the way of composition should be innovative, so that students can feel into a situation and get a new experience and a new discovery.

2.1.5. Integrity Principle

Situational teaching model, collaboration, conversation and meaning construction together become the four major elements of learning environment. It is a part of the system, whether it is social situation, motivational situation, cognitive situation, or conceptual situation, problem situation, process situation and regular situation, their design cannot be separated from other links, but should be an organic part of the system, to constitute the foundation of other classroom teaching links. Therefore, the situational teaching model should take into account the connection with other three links, should be conducive to the expansion of other elements, to help students successfully complete the meaning of new knowledge construction.

2.2. The general Operation Framework of Situational Teaching Model

Situational teaching model is based on the design of teaching scenarios to develop students ‘ability to discover and solve problems and innovative ideas; the basic process is shown in Figure 1.

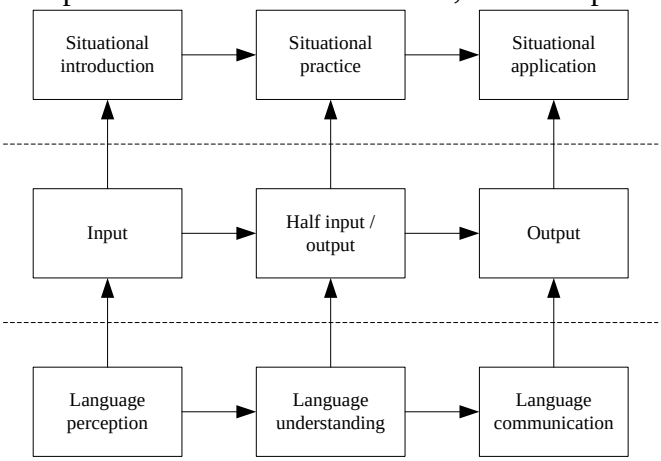

Figure 1. General operation framework of situational teaching model

Firstly, scenario introduction. Scenario introduction is not only the stage when students come into contact with new language materials, but also the stage when students form new language concepts. In teaching, teachers can help students perceive new words and sentences by presenting static situations such as objects, pictures, slides and projections, in order to establish the relationship between voice, form and meaning, and carry out listening and imitation, etc. In this paper, knowledge stock structure is established and scenario introduction is realized.

Secondly, scenario training. Scenario training is not only the practice stage for students to learn

new language materials, but also the consolidation stage for students to form new knowledge. In this stage, teachers can create dynamic situations for students to do alternative exercises to understand and master new materials and knowledge. Scenariotraining is the key part of the situational teaching model. This paper realizes the situational training through virtual reality technology, and then makes a detailed analysis [7].

Thirdly, scenario application. Scenario application is a process of assimilation, which is the stage of students'flexible use of new materials. It is also a development period of students' ability to form. At this time, teachers can cultivate students' ability to use flexibly through creating story scenes.

2.3. Establishment of Knowledge Stock Structure

The knowledge base model is designed from three parts: learning resources, learning targets and learning objects. The specific design uses Java + UML construction technology [8-9]. The model describes various attribute mapping entities in the knowledge base, including address descriptions of various learning resources, learning targets, learning objects and situational features that match the student model and teacher model, resource acquisition approaches, teaching activity sequences and knowledge presentation strategies that match the teacher model.

2.4. Design of Virtual Reality Scene

The purpose of realizing the accurate modeling of virtual objects is to establish a strong "Immersion" virtual reality scene and complete the scene teaching model [10].

2.5. Establishment of Three-Dimensional Model

Establishment of three-dimensional model is the key of virtual reality scene design, and also the key of situational learning model design. It mainly includes four stages: three-dimensional image registration, three-dimensional image fusion, texture mapping and instantiation.

2.5.1. 3D Image Registration.

ICP (Iterative Closet Point) algorithm is a method based on depth image iteration of the nearest point. In this section, the ICP method is used to achieve three-dimensional image registration. Precise splicing is achieved by iteratively minimizing the corresponding points of source data and target data. To register the data of two point sets needsthetwo point sets to be registered to have a certain intersection, so before ICP registration, two images need to be manually adjusted to meet this condition. The essence of the ICP algorithm is an optimization algorithm based on the least square method. The detailed process of 3D image registration using the ICP algorithm is as follows.

In the three-dimensional image space R^3, there are two point sets of P_m and P_n containing x coordinate points, respectively, which can be described as $P_m = \{p_{m1}, p_{m2}, \cdots, p_{mx}, p_{mi} \in R^3\}$ $P_n = \{p_{n1}, p_{n2}, \cdots, p_{nx}, p_{ni} \in R^3\}$.

Each point in point set P_m in three-dimensional space is transformed into another set of point sets $p_n = R * p_n + T$ to form a one-to-one correspondence. The transformation can be described as:

$$P_{ni} = R \cdot p_{mi} + T \tag{1}$$

Where, R is used to describe the 3D rotation matrix, and T is used to describe translation vectors. Supposing that P_m and P_n are data sets of two images, P_m is used to describe the data of the point set of the image to be registered, P_n is used to describe several data of the original image.

The initial rotation matrix T is a unit matrix, and the translation vector T is a zero vector. According to the principle of minimum Euclidean distance between two points, the corresponding point sets P_m and P_n are obtained by point-to-point searching method.

According to the SVD decomposition algorithm between two points set P_m and P_n, R and T can be obtained, that is to complete one registration.

Update points set p_n according to $p_n = R * p_n + T$.

Determine whether the current error meets the pre-set error threshold, and if so, terminate; if not, repeat the above process until it meets [11].

2.5.2 Local Texture Mapping

There are mainly two kinds of local area texture mapping algorithms: hemispherical texture mapping algorithm and local spherical texture mapping algorithm. The texture mapping formula for hemispherical surfaces is:

$$\begin{cases} u = \dfrac{2\alpha}{1+\sqrt{1+\alpha^2+\beta^2}} \\ v = \dfrac{2\beta}{1+\sqrt{1+\alpha^2+\beta^2}} \end{cases} \tag{2}$$

Where, $\alpha = \tan\varphi\cos\theta$, $\beta = \tan\varphi\sin\theta$, φ represent the mapping of images to the regions which latitude is less than φ .

The mapping formula for local spherical texture mapping algorithm is:

$$\begin{cases} u = \dfrac{\sqrt{1-\sin\varphi}}{\sqrt{1-\sin\varphi}} * \cos\theta \\ v = \dfrac{\sqrt{1-\sin\varphi}}{\sqrt{1-\sin\varphi}} * \sin\theta \end{cases} \tag{3}$$

In this paper, local spherical texture algorithm is applied to texture mapping.

The implementation of texture mapping is described in detail above, but during the running of the program, we noticed that the image displayed on the screen has obvious jagged, even in the rotation of the ball image bouncing. In this section, the adjacent four pixels in the texture are processed by bilinear interpolation to smooth out the sawtooth between the screen output pixels.

Assuming that $f(i,j)$ is the pixel color corresponding to the coordinate (i,j), and assuming that $(i+u, j+v)$ is the repair coordinate value, then

$$f(i+u, j+v) = [1-u, u]\begin{bmatrix} f(i,j) & f(i,j+1) \\ f(i,j+1) & f(i+1,j+1) \end{bmatrix} \tag{4}$$

Where, i and j represent non negative integers.

3. Results

In daily teaching, experimental teachers adopt appropriate methods and approaches to create as many and appropriate teaching scenarios as possible according to the principles of scenarios in chemistry teaching. Variable control: all students, using the same textbooks and exercise books, teaching progress, teaching hours and assignments are completely consistent. During the experiment, random and targeted interviews are conducted among students of different levels and genders.

After a semester's hard work, the experiment ended. The results of the unified chemistry test at the end of the first semester of senior school are taken as the results of the post-test, and a questionnaire survey is conducted to investigate the students' interest in chemistry, i.e. the two classes are tested. A total of 120 questionnaires are distributed, and 8 copies of the waste volume are collected, and 112 valid questionnaires are obtained.

The scores of students' interest in chemistry before and after the experiment are described in Table 1.

Table 1. Students' interest score in chemistry before and after the experiment

Stage	Valid questionnaires / copies	Average score / points	Standard deviation/points
Before the experiment	120	10.13	4.155
After the experiment	112	14.06*	2.269*

Note: * there is a significant difference between before and after the experiment, P<0.05.

Questionnaire survey shows that there is a significant difference in the level of students' interest in chemistry learning between the experimental class and the control class before and after the experiment.

Table 2 describes the comparison of chemistry learning results between the experimental class and the control class.

Table 2. Comparison of chemistry results between experimental class and control class

Class	Mid-term of the first semester			Final-term of the first semester		
	Pass rate /%	Excellent rate /%	Average score / points	Pass rate /%	Excellent rate /%	Average score / points
Senior one (Class 1) key class	86.5	61.9	81.2	88.2	62.9	82.3
Senior one (Class 2)	62.7	23.6	66.3	61.5	23.5	64.5
Senior one (Class 3)	63.5	23.1	68.9	68.9	26.6	66.7
Senior one (Class 4)	62.1	22.5	64.9	64.6	25.9	65.2
Senior one (Class 5)	59.9	19.2	61.5	61.9	18.2	61.3
Senior one (Class 6) key class	87.3	66.8	83.6	91.8	69.2	86.8
Senior one (Class 7)	65.2	23.9	69.5	69.5	31.5	70.3
Senior one (Class 8)	61.5	22.5	62.3	61.1	22.6	65.1

Through the qualitative comparison of the chemical examination results, it can be seen that the two experimental classes in this experiment also have differences in the chemical examination results compared with other parallel classes. There are two parallel classes in the key class, and there are six parallel classes in the general class. But in the midterm exam of the first semester, the chemistry scores of the two experimental classes are slightly higher than those of the other parallel classes. In the final exam of the first semester, the average score, passing rate and excellence rate of the two experimental classes are higher than those of the other parallel classes.

4. Discussion

A situational teaching model is established, and its influence on classroom teaching results is also studied.

Firstly, the situational teaching model is applied to the geography classroom teaching. Two classes are used as examples to compare. Class A is taught in the traditional way, while Class B is taught with the situational teaching model. In the random test of 12 questions, the correct rate of the

students in Class A taught with the traditional teaching method is 71.6% and that in Class Btaught with the situational teaching model is87.3%, which shows that the situational teaching modelcould improve the students'academic performance. This is mainly because the situational teaching model is repeatable, students can watch the geographical teaching scene independently, improve their understanding, and thus improve their academic performance.

The situational teaching model is applied to chemistry classroom teaching to study the effect of situational teaching model on classroom teaching. It is found that the level of students' interest in chemistry after the experiment is significantly higher than that before the experiment, and the difference is statistically significant, indicating that the situational teaching model can improve students'interest in learning, mainly because the situational teaching model is vivid.

Conclusion

This paper establishes a situational teaching model, studies the influence of the situational teaching model on the teaching effect, and draws the following conclusions:

The situational teaching model is vivid, which can arouse students'emotional interest and cultivate students' ability to explore independently.

Compared with other forms of situational teaching, the special feature of situational teaching model teaching is situational repeatability, which can show the content of situational teaching many times. Situational teaching model uses modern information technology, which can collect and store all the information. It can be used many times after information processing. With this advantage, situational teaching model can save the teaching content in electronic form, which is convenient for students to study anywhere and at any time. This breaks the traditional teaching method. The idea of learning is confined to the four walls of the classroom. It is very helpful for students to understand knowledge and consolidate learning content through repeated observation and learning of teaching content.

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