Intersubjectivity and Virtual Practice in Courses Teaching

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Abstract—Based on the intersubjectivity during the teaching of teachers and the learning of students, this study explores the application of intersubjectivity and virtual practice teaching in courses teaching. By studying the current situation of intersubjectivity, virtual practice teaching, and teaching in courses teaching in China, this study designs the immersive virtual practice teaching stage from the perspective of practice according to the connotation of intersubjectivity and its application in courses teaching in colleges and universities. In the stage of immersive virtual practice teaching, by determining the beneficiaries of the course, designing the teaching objects, analyzing the teaching pain points, and designing and optimizing the teaching thinking, the HMM-FNN gesture recognition model was used to identify the gestures operated by the teachers and students in the process of immersive virtual practice teaching. The model further analyzed the advantages of virtual reality technology during the process of courses teaching in view of gesture recognition in the process of courses teaching. Empirical results show that this method can effectively prolong the students' memory of courses teaching and greatly improve the interactive range of teaching resources. The lowest loss value of gesture recognition between the teachers and students is only 0.4, and virtual practice teaching has strong application. After application, the number of students who fail to pass the examinations dropped significantly, which can effectively improve the scores of students.

Keywords—intersubjectivity, virtual practice teaching, courses teaching, subjective education, individuation, gesture recognition

1 Introduction

Along with the development of new media and information technology, a large number of new technologies have been applied in the teaching of courses, providing support to the learning of students. In the process of learning, students need to use a large number of knowledge points in practice to deepen their understanding of the course content, use virtual technology to build a practice teaching environment, guide other students to strengthen their understanding of the course in the virtual environment, and realize virtual practice teaching. In the traditional teaching mode, the rela-

tionship between teachers and students is as active knowledge giver and passive knowledge receiver, respectively, and so there are subjective and objective contradictions between teachers and students. At present, China proposes a "student-centered" approach, builds an equal interactive teaching environment, designs lifestyle education and people-oriented content, conforms to the individualized development, and carries out teaching activities openly and interactively. Intersubjectivity and virtual practice teaching are also understood to be geared toward promoting communication and interaction between teachers and students by utilizing the co-existence of intersubjectivity, interaction of cognitive mode, and practicality of communication [1], thereby achieving knowledge sharing.

The development of network technology has promoted the development in all walks of life and restructured the education structure, where students are no longer confined to the classroom [2]. Especially for virtual practice teaching, students can study at any time and place, a development that provides very convenient conditions for the learning of students and the teaching of teachers. However, virtual practice teaching is online teaching; students and teachers cannot meet face to face and are unable to perceive the performance of interactivity between learning and teaching. Therefore, it is necessary to study the application of intersubjectivity and virtual practice teaching in. Facing the application of gesture recognition between teachers and students in courses teaching, this study analyzes the advantages of virtual reality technology in the process of teaching. Practical teaching in courses teaching is an important manifestation of improving the course quality, but there are still problems in the process of concrete practice, such as impaired concentration of students and environmental impact, all of which make the teaching efficiency of courses teaching poor. The development of virtual reality technology has led to its wide application in the field of education. The virtual course constructed by using virtual reality technology is applied to the teaching of courses teaching, thus increasing the interest in teaching a class. The application of virtual practice teaching in courses teaching does not replace the original teaching mode but instead further supplements the courses teaching on the basis of the original courses teaching. Virtual reality technology has strong advantages in the application of courses teaching. It can not only improve the interests of students in learning but also enhance the subjectivity of students in the teaching process so that the interaction between teachers and students is more frequent, and the interactivity of knowledge is greatly improved.

To improve the learning efficiency of students and the interaction between students and teachers in virtual practice teaching, this study examines the application method of intersubjectivity and virtual practice teaching in courses teaching with students and teachers as the main body. The design model of immersive virtual practice teaching stage is constructed, and the virtual interactive dynamic gesture recognition method is used to identify the gestures of teachers and students in the teaching of courses teaching to improve the interaction of courses teaching. This helps create an equal exchange environment for courses teaching, activate rich resources, and organize flexible and creative practical teaching activities.

2 Literature review

Intersubjectivity and virtual practice teaching are helpful to improve the teaching effect of courses teaching. Virtual reality technology is used to construct the scenes of courses content so that students can feel the environment in the classroom without going out, stimulate their brain to the intensity of memory for the course content, and improve their visual sense. The teaching environment that students see in the virtual practice of courses teaching is fictional, but the knowledge and their current feeling are real, which helps prolong the time for students to memorize the courses teaching content and make such content play a greater role. For example, Li [3] conducted practical research on implicit courses teaching in colleges and universities. The method used analyzed the advantages and disadvantages of courses teaching from the perspective of explicit education as well as analyzed the characteristics and advantages of implicit, which should use new media to promote implicit courses teaching to improve the theoretical level and moral integrity of college students. Wu et al. [4] from the perspective of artistic conception in the teaching mode of courses teaching, studied different teaching methods to increase the number of interactions between teachers and students, improve the fun in courses teaching classes, and enhance the effectiveness of teaching content. Lindeman et al. [5] applied virtual reality technology in the modular teaching process and established simulation models through virtual reality technology to realize the corresponding teaching. This teaching mode can improve the interactivity of students and greatly improve the teaching effect of teachers.

Intersubjectivity and virtual practice teaching help improve the interactive effect of courses teaching. Compared with earlier traditional teaching methods, the introduction of virtual reality technology into the teaching of courses teaching has greatly improved the subjectivity of students. Students learning are not limited to "listening" and "writing"; they can take the initiative to participate in the teaching process of the teachers when learning. The principal roles of the students and teachers are gradually balanced, and the participation of the students in practical teaching is improved as they play an increasingly important role as subjects. Kim [6] designed online learning methods by using current teaching resources in media and networks as well as adding virtual technology into the teaching content of courses teaching to analyze the influence of courses teaching on the study and life of students. In view of the current single teaching mode, Subrayen et al. [7] studied the Internet teaching system based on virtual reality technology and connected the cloud platform with the client, which enriched the current teaching mode of colleges and universities with good application. Yu [8] added multimedia technology into the process of courses teaching to improve the interaction between teachers and students in the form of a conversation group. This method is convenient for teachers to manage students and improve their interest in study.

Intersubjectivity and virtual practice teaching help construct a unique learning atmosphere. Personalized teaching is a teaching method that has been advocated by many schools in recent years. Teachers can conduct targeted teaching for students according to their characteristics, simulate different courses teaching, provide students

with a unique learning atmosphere, and enhance their interest. Personalized teaching can also improve the students' sense of worth, social view, and view of life. Darr et al. [9] applied virtual reality technology into the teaching process and analyzed the shortages existing in actual teaching courses by discussing the significance and advantages of virtual reality technology in teaching courses. Their goal was to promote the development of virtual simulation teaching. Zhang [10] analyzed and discussed courses teaching from the perspective of three education, and sought for the reform plan of courses teaching. Aiming at the teaching behavior of students, Luo [11] introduced artificial intelligence technology into classes. Moreover, the author used the artificial intelligence algorithm to monitor the teaching class, adjusting teaching modes according to monitoring results to improve the interactivity between teachers and students as well as the permeability of specialized knowledge. Keefe et al. [12] applied 3D simulation teaching in the process of laboratory teaching, took computer as the basic platform, and promoted students' learning interest by establishing character virtual scenes. Hou et al. introduced the teaching mode combined with online and offline teaching into the courses teaching process in view of the poor acceptance of courses teaching resources by ethnic minorities to realize the sharing of superior educational resources [13]. According to the principle of interconnection, Cao et al. [14] optimized the classroom structure of courses teaching in colleges and universities as well as established an interconnected teaching mode of courses teaching by strengthening the guarantee mechanism. Afonso et al. [15] studied the interactivity between teachers and students and the enlightenment of students in the teaching process from the perspective of intersubjectivity.

In conclusion, from the perspective of the current study on course teaching, intersubjectivity, and virtual reality teaching, each research method has different defects. On the one hand, although some of them introduced virtual practice teaching and had a certain effect, it did not involve the interactivity between teachers and students and so the teaching effect is not ideal. On the other hand, some methods paid attention to the interactivity between teachers and students and made a corresponding reform on the courses teaching mode but did not apply the new teaching method, which is the most widely used at present. Therefore, its final application effect is not ideal. In view of the above situation, this study analyzes the connotation of the intersubjectivity between teachers and students and its role in the application.

3 Method

3.1 Connotation of intersubjectivity

Intersubjectivity refers to the subjects who interact with one another in communication and interaction. Proposed by Husserl, this theory can describe the state of spiritual communication of people [16]. Many scholars have enriched the definition of intersubjectivity, taking subjective and objective as conditions. The phenomenon that the subject's own experience changes subjectivity is also an interactive relationship beyond common customs and themselves. Each intersubjectivity can freely exchange

their feelings and thoughts without being affected by individual differences. There are some differences in the concept of intersubjectivity in philosophy and sociology, but in general, it is the collision of thinking between people and the behavior of enhancing the cognitive space of the subject. This study introduced the idea of intersubjectivity into the courses teaching classroom and regarded the teaching of teachers and the learning of students as each other's subject. It likewise analyzed the application of intersubjectivity in courses teaching by studying the interactive relationship between teachers and students.

3.2 Application of intersubjectivity

In the face of modern teaching modes in colleges and universities, the subjective education concept has attracted more attention from the majority of parents and colleges and universities since it was put forward. Many education experts believe that the consciousness of students is subjective and is affected by the perceptual and rational subjective forms. However, such consciousness is the feedback of the students' brains to the existence of objective things, and the objective phenomenon is formed into consciousness through brain processing. To improve the subjective consciousness of students in the learning process, virtual practice teaching is applied to the teaching process of courses teaching.

According to the subjective education concept, courses teaching are the best way to cultivate high-quality talents. When teachers carry out virtual practice teaching, the teachers are the main body for promoting quality education while the students are the main body for self-learning. Students and teachers jointly constitute the intersubjectivity relationship of course teaching. When the teachers are the teaching subjects, they should fully grasp the needs and purposes of the students in learning the courses as well as exchange the psychological role in the courses to feel the subjectivity of the students learning courses from the perspective of the students as the subject. In the process of course teaching, the care of teachers for students is one of the ways to improve the subjectivity relationship between teachers and students. In addition, it can fully explore the characteristics of different students and encourage them so that the abstract subjectivity relationship between teachers and students can be put into practice. After clarifying the subjective status of students in courses teaching, the various abilities of students are cultivated imperceptibly in daily learning courses processes, which improve their cognitive level.

3.3 Intersubjectivity of the virtual practice teaching

When the intersubjectivity virtual practice teaching method is applied to the courses teaching, the cognition of students can be improved. Cognition is the foundation of self-thinking, and the ultimate goal of cognition is practice. It cannot be achieved by the teachers and students taking the goal as purely only for interaction during the teaching of teachers and the learning of students; it needs to adopt corresponding methods to enable teachers and students to participate in the course and share their emotions through practice. In the process of virtual practice teaching, the teaching

content of teachers and the learning content of students coexist, and cognitive unity of teachers and students can be achieved through their interaction. From the perspective of virtual teaching, the mode of expression and teaching ideas of teachers in courses teaching are all factors that affect the understanding of courses between teachers and students. To achieve better intersubjectivity between teachers and students, immersive virtual practice teaching should be designed as shown in Figure 1.
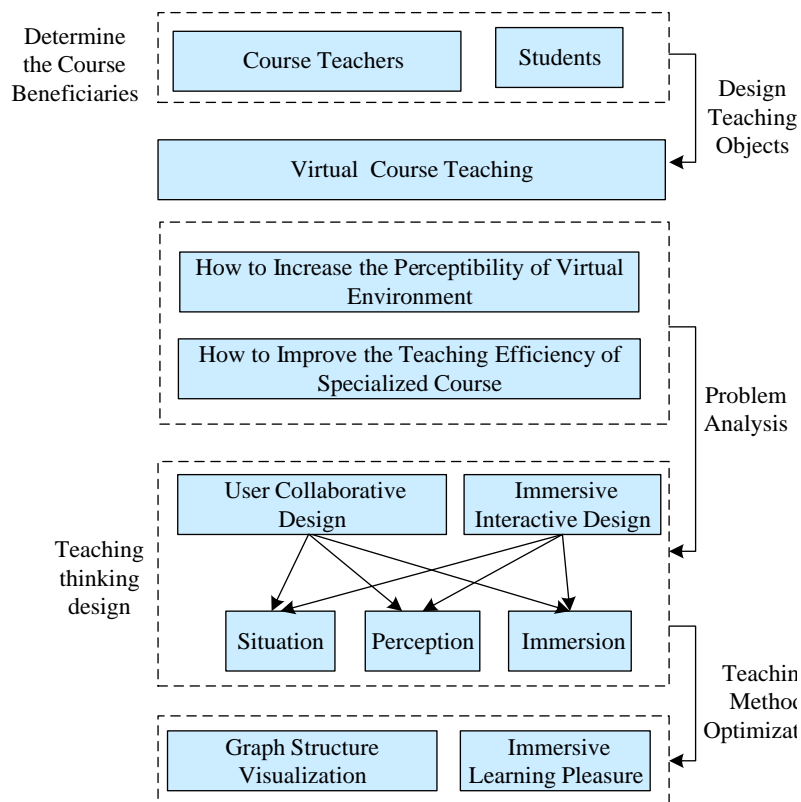
Fig. 1. Immersive virtual practice teaching stage

Figure 1 shows that the virtual practice teaching stage of immersive teaching can be divided into five stages: determining the course beneficiaries, designing teaching objects, analyzing the pain points of teachers, optimizing teaching ideas, and teaching methods. The teaching scheme of virtual courses is designed for the beneficiaries of the course. During the teaching process, the teachers can reflect on how to improve the efficiency of virtual teaching and courses teaching by perceiving the virtual teaching environment and current teaching efficiency. After their self-examination of teaching pain points, they shall design collaborative and immersive teaching thinking to improve the students' knowledge identification level from three aspects, namely, context, perception, and immersion. Moreover, they must make effective optimization of existing teaching methods in terms of graph structure and immersion pleasure

method of students in view of the current courses teaching situation and then further improve the intersubjectivity between teachers and students.

3.4 Methods to improve the intersubjectivity of immersive virtual practice teaching

To improve the efficiency of immersive virtual practice teaching for courses teaching, virtual interactive dynamic gesture recognition method is used to identify the gestures of teachers and students in courses teaching. To recognize the gesture, the HM-FNN gesture recognition model is established by combining the hidden Markov model and fuzzy neural network model, which together can be used to identify the gestures of teachers and students in immersive virtual practice teaching. The HMM-FNN gesture recognition model consists of five levels, and the gesture recognition process of the model is as follows.

The first layer of the HMM-FNN gesture recognition model is the input layer. Data such as gesture change sequence, change track, and hand area is input into this layer to match with the input layer node. The second layer of the model is the fuzzy layer. It performs fuzzy iterative processing on the sequence of gesture change, change track, and observation value sequence of the hand area and obtains the number of categories of gesture change sequence, change track, and hand area according to fuzzy rules. The third layer is the connection layer, which calculates the contribution of gesture category according to the fuzzy rules and calculates the number of antecedents of the fuzzy rules, which is expressed as follows:

$$F_j^{(3)} = \sum_{i=0}^{m} \omega_{ij} Y_{ij}^{(3)} = \sum_{i=0}^{m} \omega_{ij} p(Q/\lambda_i) \tag{1}$$

In the above formula, $F_j^{(3)}$ represents the number of previous item before i gesture fuzzy rule, j and m represents the number of nodes and input values respectively, Q, $p(Q/\lambda_i)$ represents the sequence of sequence of observed values and likelihood probability respectively; $Y_{ij}^{(3)}$ represents the assembly of gesture, ω_{ij} represents the gesture weight.

The fourth layer of HMM-FNN gesture recognition model is normalized layer, the number of network nodes on this layer is the same as the number of nodes on the previous layer, and make normalized processing for gesture fuzzy rules to avoid the vibration of model and then influence the final gesture recognition result. The total output of gesture fuzzy rule is 1, so the formula of normalization is as following:

$$F_j^{(4)} = \frac{Y_j^{(4)}}{\sum_{j=0}^{N} Y_j^{(4)}} = \frac{F_j^{(3)}}{\sum_{j=0}^{N} Y_j^{(3)}} \tag{2}$$

In formula (2), "N" indicates the number of fuzzy rules.

The fifth layer of HMM-FNN gesture recognition model is the output layer, and the output result of this layer is the final result of gesture recognition, which formula is as following:

$$F^{(5)} = \sum_{j=1}^{N} \omega_j F_j^{(4)} \tag{3}$$

In the formula, $\sum_{j=1}^{N} \omega_j = 1$.

After the above steps, it can get the gestures of teachers when they teach course and the gestures of students when they attend the class, and perform corresponding course teaching according to their gestures to further improve the interactivity between teachers and students.

4 Results analysis

The method mentioned in this study is applied in the classroom where courses are taught to test the practical application effect of this method. Unity3D software is used to build the virtual practice course environment and Kinect to access and expand the gesture recognition program. An RGB camera and a depth sensor are used to identify the gestures of students in the classroom and C++ language to write programs. With frontier in computer technology as the theme, a discussion section is constructed, and the teachers serve as consultants to assist the students to independently explore knowledge, guide them to ask questions, think about questions, and find solutions. During online teaching, gesture recognition technology is used to identify the gestures of students so that teachers can receive feedback from students in real-time and then change their teaching method or schedule accordingly.

The resource interaction output is an important indicator of the interactivity between teachers and students in the process of virtual practice teaching. The amplitude of interactive output of courses teaching resources and the change in students' memory duration before and after the application of the method mentioned in this study were counted. The results are shown in Table 1.

An analysis of Table 1 reveals that before the application of this method, the amplitude of resource interaction output of students is 56–83 db when they are learning courses, and their maximum valid memory duration is only 10 days. However, after the application of the method, the amplitude of resource interaction output of the students when they are learning courses shows an upward trend with the increase of months of application, and their valid memory duration increases by 23 days from the initial 7 days. The above results show that the method mentioned in this study can effectively improve the efficiency of students learning, and the interactivity between teachers and students can be effectively improved.

Table 1. Test interactivity between teachers and students in courses teaching

Month	Before application		After application	
	The amplitude of resource interaction output/db	*Memory duration of students/days*	*The amplitude of re-source interaction output /db*	*Memory duration of students/days*
1	75	5	83	7
2	69	7	89	8
3	81	6	91	9
4	83	8	95	11
5	68	4	98	13
6	73	6	110	15
7	71	9	146	16
8	56	8	159	17
9	81	8	183	18
10	82	7	191	19
11	73	9	201	21
12	70	10	209	23

The recognition of operation gestures during virtual practice teaching is also one of the indicators reflecting the interaction between teachers and students. Table 2 shows the loss values of gesture recognition obtained by the method in this study when testing different gestures and quantities.

Table 2. Recognized loss values of different gestures and quantities

Quantity	Gesture 1	Gesture 2	Gesture 3	Gesture 4
20	3	3	3	3
40	2.8	2.9	2.7	2.8
60	2.6	2.6	2.4	2.6
80	2.4	2.4	2.1	2.1
100	2.3	2.2	1.9	1.7
120	1.5	1.8	1.6	1.5
140	1.2	1.6	1.1	1.3
160	0.8	1.4	0.9	1.1
180	0.6	0.9	0.7	0.9
200	0.4	0.8	0.5	0.6

Table 2 shows that the loss values of gesture recognition is 3 when the quantity of gestures is 20 under different gestures, and the loss values of different gestures' recognition decrease in different degrees with the increase of the quantity of gestures. When there are 200 gestures, the loss value of the four different gestures' recognition is low, the lowest value is only 0.4. The result shows that the method in this study has good accuracy in identifying the gesture operation of teachers and students in virtual practice teaching. In addition, the virtual practice course has good applicability, which can also verify the good interaction between teachers and students. The most direct

indicator to measure the teaching effect of courses teaching is the examination scores of students. This indicator calculates the number of students who failed the courses examination of this major after the application of this method. The result is shown in Figure 2.
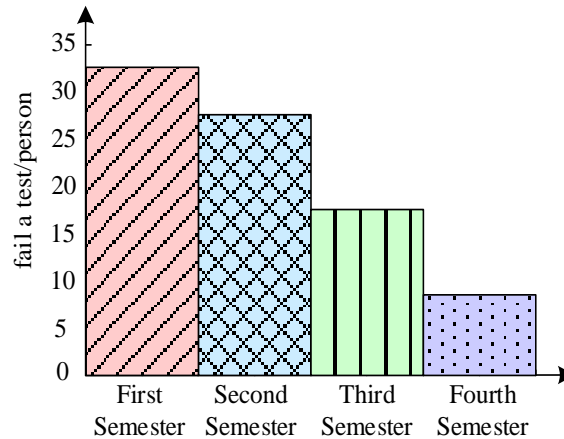

Fig. 2. Teaching effect of the courses

Figure 2 illustrates that the number of students who failed in courses examination showed an obvious downward trend after the application of the method in this study; specifically, it decreased from 33 students in the first semester to 8 in the fourth semester. The results showed that the method can effectively improve the scores of students in courses after using they use the method and verified that the cognitive level of students is effectively improved from the side. To be effective, it first needs to cultivate the interests of students in learning when applying the intersubjectivity virtual practice teaching to the courses. The teachers, as assistants, must guide students to take the initiative in accepting knowledge, organize students to participate in practical activities through various social hot issues, attract students' attention, and mobilize their enthusiasm through the application of interactive technology. Then, it is necessary to cultivate the creative thinking of students and design vivid and interesting teaching content. The teachers must teach students with full patience and guidance, go deep into the practice process of students, know their actual demands, and take the students as the main body. They should also unearth the creativity and independence of students, guide students to consider and solve problems from several aspects, exercise students' minds, and broaden their horizon in practical activities.

5 Conclusion

In this study, students and teachers are taken as each other's subjects and the application method of intersubjectivity virtual practice teaching is explored. The method is applied to the courses teaching process of a certain major. The course's teaching

shows that the application of this method in this study can effectively improve the memory duration of students, largely increase the interaction between students and teachers, and improve the status of students as the subject. The following conclusions are drawn by identifying the operation gestures of teachers and students in the virtual practice teaching:

1. Small recognition loss value indicated that virtual practice teaching can be effectively applied to courses teaching.
2. After the method was applied, the number of students who failed the examination of the course decreased, indicating that the method has good applicability.
3. The proposed method can meet the demands for interactive virtual teaching in courses teaching and enhance the learning and understanding ability of students.

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7 References

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