Discussion and Practice of Virtual Reality Course Group Construction Based on Ability Orientation

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Abstract: Combined with training objectives and oriented by improvement of students' practical ability, this paper discusses construction, teaching model reform and ability training of VR course group. Through cases, it analyzes how to train students' innovative thinking ability, stimulate students' ability to find and solve problems, which achieved good teaching effect.

1. Introduction

Virtual Reality, abbreviated as VR, is a kind of computer simulation system that can create and experience a virtual world. It is a virtual environment with a good user experience. Users immersed in simulated environment can be perceived by environment, and can interact with environment. In virtual environment, users can play their imagination and form new cognition and concept. With development of 5G technology, VR technology has ushered in a new round of outbreak. On the contrary, VR also provides a broader application support for development of 5G. In VR ecosystem, there is a great shortage of content production and VR talent.

Many colleges and universities are actively transforming related majors and implementing virtual reality-related talent training programs. In 2016, University where author works also started setting up direction of virtual reality in digital media technology major, and trained application-oriented talent for virtual reality content production and interactive development. Guided by modern educational ideas and theories, course group is an organic course system integrated by a series of courses that are closely related, inherited, infiltrated, and complementary in content, which should be constructed according to training system and objectives of professional talents [1].Course group construction can enable students to obtain maximum theoretical knowledge and practical experience at the lowest cost in an effective time [2].

2. Construction of Virtual Reality Course Group

Combined with training goals of the major, and adapting to positioning of application-oriented personnel training [3], VR course group construction aims at cultivating students' ability to use comprehensive knowledge flexibly and innovative thinking. In the process of constructing VR course group, it mainly focuses on two aspects: teaching content and practice system.

Although VR professional direction is newly set, in terms of VR content production and application, many existing course construction results of digital media technology majors are still suitable for use. Teaching content construction of course group should pay attention to opening time of course, and ensure reasonable connection of contents between courses. The former course is to lay theoretical and operational foundation for the following courses.

Practice system highlights stratification of inside, between, and outside the course, and designs a teaching model of "increasing from inside to outside, strengthening from outside to inside". Practice system emphasizes gradual improvement process from simple to complex, from verification experiment, design experiment to comprehensive practice [4]. In-class experiments cultivate students' basic abilities, inter-course experiments (Comprehensive Design course at the end of

semester) do students' professional abilities, and out-of-curricular experiments (practice, professional training, etc.) do students' comprehensive practical abilities and job capability.

3. Exploration on Construction of Virtual Reality Course Group

3.1. Flipped Classroom Teaching Mode

Flipped classroom is a new teaching mode that reverses traditional teaching. It arranges process of knowledge transmission under class, and process of digestion and understanding of knowledge in class. It reflects teacher-guided teaching and student active learning, which follows learning-centered teaching concept [5]. Flipping classroom has achieved good results in practice at home and abroad [6]. Based on past experience of course construction, VR course group implemented flipped classroom teaching during first round teaching, and each course in course group had part of teaching content to implement flipped classroom teaching.

When preparing lessons, teaching team recorded some micro-videos or made some small animations to help students understand more difficult knowledge points. Before class, teachers asked students to complete video study and do basic knowledge quiz. Nowadays, online teaching platforms have many functions. It can control students to answer questions interactively while watching videos before they can continue watching videos. In this way, understanding and learning effect of learning content can be guaranteed.

For content of experimental practice, implementation of flipped classroom is as follows: in class, what we discuss and communication includes problems in experiment, analysis and demonstration of experimental results, and guiding students to put forward deeper problems according to experiment. Complex experimental process is completed before class. This teaching mode not only expands students' knowledge, but also cultivates students' ability of independent learning. Of course, due to particularity of VR course, some experiments need to be done with help of laboratory hardware. Course construction and implementation can't be separated from any one of teaching implementation and management department, such as guarantee of relevant hardware by laboratory managers.

3.2. "Mutual Penetration" Teaching Model

When course group is constructed, arrangement of teaching content is connected in place, but results are often unsatisfactory in teaching [7]. During former course study, students do not understand subsequent courses, and think that this course is useless for follow-up course and employment. During learning follow-up course, it is necessary to use content of former courses, and students often reply that they don't remember. In view of these problems, VR course group solves similar problems through "mutual penetration" teaching arrangements, and also enables students to know importance and necessity of each course.

As shown in Figure 1, course group construction and ability training. Project-based implementation process is adopted to arrange teaching content [8], and each course corresponds to corresponding ability training required during project implementation process.
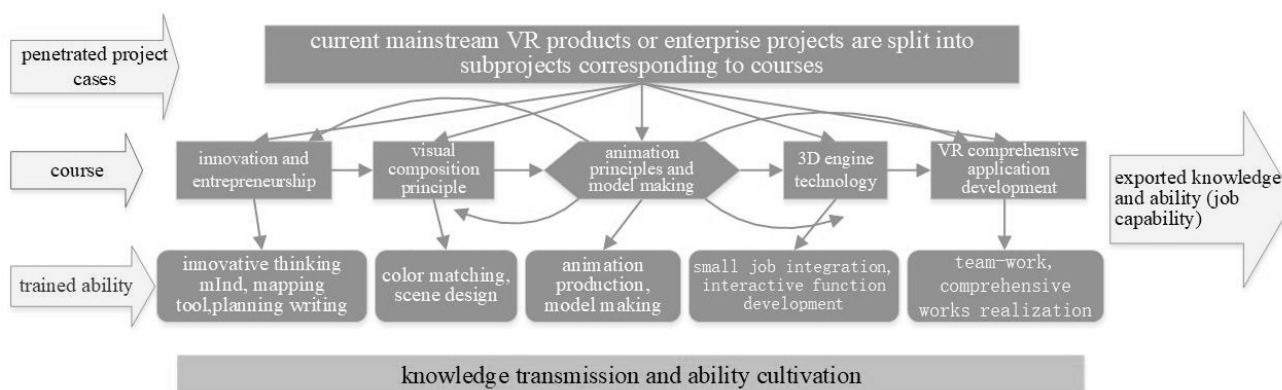

Figure 1. Course Group Construction and Ability Training

During class, teaching team introduce implementation and operation of project with current mainstream VR products or enterprise projects. Meanwhile, through a specific and in-depth decomposition of project, teachers inform students of correspondence between content of this course and a certain link of project. These different links must be an indispensable part of project. Through this kind of teaching method, students have a more intuitive understanding of learning objectives of course, and stimulate motivation to learn. This process is called "whole to partial" penetration. One of main results of Innovation and Entrepreneurship course is a work planning that imitates actual project.

Comprehensive Design course aims to consolidate theoretical knowledge and use theory to support practical training to improve students' professional abilities. It is usually completed in last two weeks of each semester. Final requirement of this course is to complete a work. The work "maps" to a certain link of project, and this process is called "partial to whole" penetration. Those small works ("parts") completed in different semesters are gradually integrated into one large work ("whole"). Goal of "mutual penetration" is to complete comprehensive works according to implementation process of project, which is also goal of course group. Comprehensive Application Development course in course group is a practical course that innovates and realizes a project by team-work. Compared with teaching cases of course group, this project has some innovations.

At the same time, course group is centered on course of "Animation Principles and Model Making". Based on this, students can be trained to have ability to VR content making, which meets training objectives. At the same time, this course is also foundation of follow-up courses, and trains students to have ability to design and develop interactive VR content. Export of VR course group is graduation design, graduation practice, etc. it is the place where knowledge and ability of course group are exported.

4. Training of Students' Ability and Case Analysis

Through how students (teams) find and solve problems in process of developing game works using three-dimensional engine technology, this section uses specific cases to analyzes cultivation of students' ability.

4.1. Integration of Ideological Elements into Professional Courses

To develop a game (such as an adventure game), student team starts thinking from story background, and write a game plan with help of tools (mind mapping, etc.) .This is not only content of innovation and entrepreneurship course in course group, but also an embodiment of cultivation of innovative thinking ability. Consideration of color matching, scene design and other issues must be based on background of game story. Team's perfect solution is premise to ensure good experience of the players, which is also content learned in course of Visual Composition Principle.

4.1.1. Students' Thinking

While playing game, if one player is lazy, he will pass level in such a way: after countdown system is activated, player does not press key and waits for time to be lost. Some games allow this to happen, but in games with theme "resisting laziness", it's obviously not allowed. Through thinking, team set up a monster tracking system to achieve purpose of game. In this system, game sets a monster role. This monster approaches role (player) at a slow speed. Player must control role by pressing keys, otherwise he will be injured or die. Once player touches key, he can't release it, otherwise player will be punished (such as reducing game time), and every time he releases key, he will be punished once, so as to prevent player from being lazy.

4.1.2. Trained Ability

An embodiment of course group construction achievements: ability to be diligent in thinking, ability to be good at summing up, ability to discover essence of problem through phenomenon and to solve the problem, etc. Course group construction adheres to theory guiding practice, hierarchical practice model, and emphasizes "project" cases. Process of finding and solving problems is actually

not easy. For students in their learning stage, they can insist on thinking, constantly trying to solve the problem with concise code, and pursue ultimate, joy of getting out of confusion after solving the problem. In course of teaching, these excellent qualities have been cultivated imperceptibly, which is also objective of ideological and political ideas.

4.2. Ability to Use Knowledge Flexibly

4.2.1. Problem Description

Function of role "monster" patrol system is that monster walks back and forth at a specific location and attacks when it finds the player. When implementing games, traditional solution is to write code, which is more intelligent. However, these intelligent features are not necessary in certain scenarios, such as in a narrow maze.

4.2.2. Innovative Solution

Through the animation system (Unity 3D), it can realize function of different monsters patrolling in different paths. In animation system, only forward patrol is set, and then animation is played through continuous loop to achieve effect of abnormal movement of role monster. During game, from player's perspective, a certain position reached by monster's movement is more like birthplace of monster. That monster acting as a guide in front disappears, and new monsters will appear in rear. As shown Figure 2.
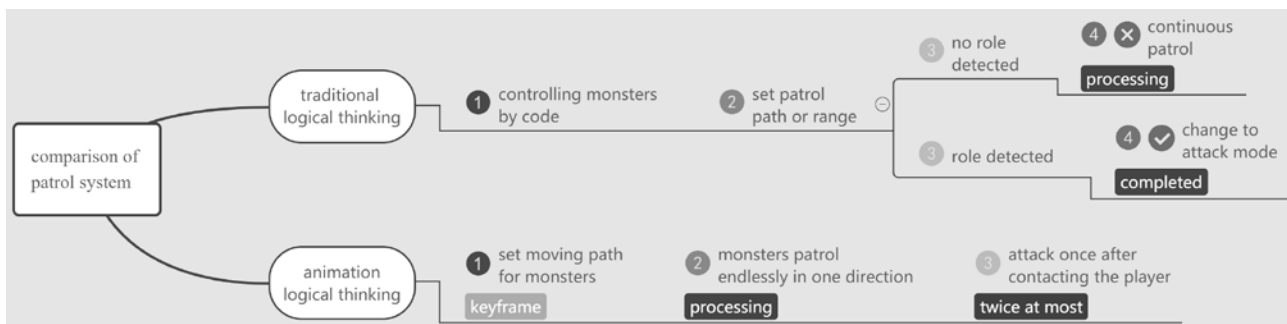

Figure 2. Comparison of Patrol System

4.2.3. Trained Ability

At learning stage, students have a thorough understanding of theoretical knowledge of animation principles. In this problem, they can see essence through phenomenon, find solution to problem, and realize this function through animation system in Unity 3D. Joy of problem solving will also bring students a desire to learn that is a relatively important ability in teaching.

4.3. Strengthening Programming Thinking in Practice

4.3.1. Finding Problem

In design of level game, there is such a plot that a role needed to climb through jumping pedal, which has function of moving up and down. However, in process of implementation, it is found that when role jumps on pedal, squeeze effect caused by collision of its own gravity and upward power might make role constantly bump. In physics, that is to say, due to not being affected by pedal inertia, role produces a kind of unreasonable jitter.

4.3.2 Solved Problem

By establishing a parent-child relationship! During game, when player's jumping position triggers the trigger of pedal, pedal senses role and establish parent-child object at first time. In this solution, parent and child objects share power, role will not bump, and that parent-child relationship will be cancelled when role leaves. As shown in Figure 3.
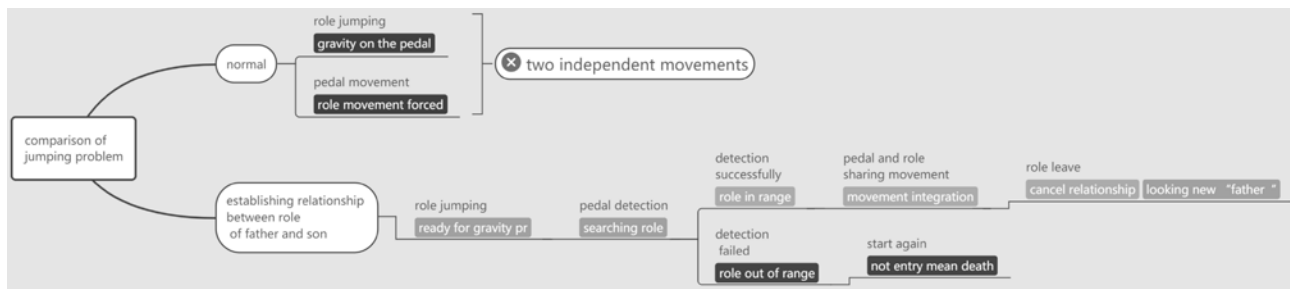
Figure 3. Comparison of Role Jumping Problems

The code is as follows：

```
public GameObject child;  // Define a variable "child"
public GameObject parent;  // Define a variable "parent"

void OnTriggerStay(Collider player)
{
child.transform.parent = parent.transform; // Code to implement role location binding
}

void OnTriggerExit(Collider player)
{
child.transform.parent = null;  // Code to achieve unbinding
Destroy (parent); // Destroy variable "father"
}
```

Students were diligent in thinking and achieved idea of solving the problem through mind maps. With help of basic course of program design, team uses program thinking to solve practical problems in Unity 3D, thus reflecting improvement of programming ability and ability to use knowledge learned flexibly.

Conclusion

After more than one round of construction, VR course group has achieved some teaching results, such as: quality of students' works has been significantly improved; topic of graduation design related to virtual reality accounts for more than 60%; students have won high-level awards in competition; outstanding works applied for software copyright, etc., which also provides a reference of course group construction for others in college.

Of course, this paper only discusses teaching model reform and ability training. In fact, course group construction also includes teaching team construction [9], evaluation methods, experiment and teaching environment guarantee, mobile teaching platform application [10], and school-enterprise cooperation, etc. These are also considered necessarily during construction of VR course group. Construction of course group needs continuous improvement!

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