Dulcimer Teaching Based on Digital Multimedia VR Technology

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Abstract: Digital multimedia technology is a variety of comprehensive information technologies with images, sounds and videos as carriers. Dulcimer teaching includes comprehensive dulcimer music education that develops dulcimer music knowledge, appreciation and creativity. The main purpose of this article is to study the application of digital media VR technology in dulcimer education. This paper adopts exploratory research methods, uses knowledge in the field of virtual reality technology, analyzes the advantages of actual teaching cases, and proposes the design of desktop computer virtual reality research programs for targeted teaching cases. And use software to display in virtual reality. The use of digital multimedia features to increase the flexibility of instructional approaches to the dulcimer has greatly facilitated the instruction of the dulcimer and promoted students' interest in learning the dulcimer. The outcome of the paper's trials indicates that with the implementation of digital media VR skills. students' interest in dulcimer has been greatly improved, their enthusiasm has increased by 25%, and thedulcimer teaching model has also been greatly improved. Satisfaction with teaching increased by 32%.

1. Introduction

Following the speedy expansion of education and culture, the education industry, like other industries, has undergone major changes. From the initial classroom instruction style to the master and learner colearning style, there has been a gradual shift to a student-led learning style. Teaching tools have also evolved from a single book, blackboard and chalk to a multimedia teaching technology integrating images, sound, video and text. The use of multimedia teaching technology not only enriches the content of the classroom, but also increased pupils' enthusiasm for studying and their academic performance enormously. It also combines the teacher's teaching experience, textbook teaching content and computer technology, and changes from

silent to sound in the classroom and on the screen. Teaching in this environment is more intuitive, vivid and intense. In the tuition session of music appreciation class, the use of multimedia teaching skills can solve the shortcomings of traditional teaching methods and methods to a large extent, maximise students' enthusiasm for studying to the greatest extent, and optimize the teaching structure.

This article analyzes and classifies virtual reality skills, and provides academic direction for VR skills and experimental courses. Virtual reality desktop is a realistic possibility for art design teaching today. Design teaching can increase students' interest in the classroom, stimulate students' sense of participation and enthusiasm for learning, after using digital multimedia courses. The interactive nature of the utilisation of the electronic programme also allows students to take their best advantage of their motivation, which can have a huge impact on improving the spatial mindset and creativity of primary school students. Moreover, it fulfils the requirement to upgrade the academic installations of the school.

Kim B G proposed a shape representation method using angle, direction and position, called "Oriented Angle Key Point (OAK)", to assistance with frame-based hydrographic solutions. His purpose is to quickly provide commercial multimedia services. The rapid growth of Internet IT technologies has boosted the pressing demand by consumers for credible and robust media rights management. However, the speedy growth of computer graphics on the web has led to results that are not very accurate [1]. Din B is trying to find a material that has good structural and electrical behaviour and is better than aluminium in all respects. Aluminium composites with a metal matrix are one answer. Typically, the metallic matrix composites include undensity materials, i.e. aluminium or magnesium, reinforced with particles of fibre or ceramic materials (i.e. aluminium oxide or diamantine). They exhibit higher proportional forces, high levels of stiffness, enhanced operating heights and excellent abrasion characteristics, and these properties can be tailored to specific applications. However, the stability of metal composite materials is not high, making the data not very complete [2]. Prichard discussed the influence of introductory music education curriculum experience on pre-service music teachers' beliefs in music teaching effectiveness and teaching commitment. The aims of his study were to investigate beliefs about the effectiveness of music teaching and his commitment to pre-service music teachers taking introductory music courses. However, the degree of music education is not enough, which makes the impact on teaching relatively large [3].

This article proposes a new teaching method for current music teaching. VR technology is analysed in detail, incorporating the drawbacks of the existing music instruction curriculum. This paper proposes supporting teaching methods and perfect instructional devices that are highly useful in inspiring students' aspirations for spatial reflection and controlling their mind in the course of modelling.

2. Digital Multimedia VR Technology Algorithm

2.1. Digital Multimedia Watermarking Technology

(1) Watermark embedding and extraction

Digital watermark technology uses host signals such as images, audio and video to carry watermark information. Different signals have different dimensions. For example, audio signals are one-dimensional, image signals are two-dimensional, and video signals are three-dimensional. However, in terms of the way the signals are stored in the computer, these signals can be regarded as one-dimensional. For

example, the image signal can be regarded as one-dimensional in the order from left to right and top to bottom in space., The video signal can also be regarded as one-dimensional according to the sequence of time and space from left to right and top to bottom:

In this way, we have a unified description of different host signals [4]. From the perspective of communication, we can regard these one-dimensional host signals as a communication channel; the watermark information to be embedded in the host signal can be regarded as the signal transmitted in the channel; for the host embedded with the watermark Various intentional or unintentional attacks on the signal can be regarded as the distortion introduced in the channel [5].

We use H to represent the one-dimensional host signal, and W to represent the watermark signal to be embedded. After adding the watermark signal to the host signal, we obtain the stego signal. This process can be expressed as:

$$S = H \oplus W \quad (1)$$

Here $\oplus$ represents a certain watermark embedding operation, which can be a simple algebraic addition, or a complex nonlinear operation and other possible processing [6]. The hidden signal embedded with the watermark may be subject to many intentional or unintentional attacks. Let us assume that the distortion caused by the attack is the signal S and the signal after the attack is R:

$$R = S \oplus E \quad (2)$$

R stands for Received signal, because from the perspective of communication, the attacked signal is the signal received by the user and the watermark needs to be extracted. We use $\otimes$ to represent a certain watermark attack operation.

(1) Watermark embedding

The basic spread spectrum technology embeds 1 bit of information in the host signal. Assume:

$$b = w_i\{-1,1\} \quad (3)$$

To represent 1-bit watermark information, first expand it with an expansion factor cr. The purpose of the expansion is to increase the redundancy of the watermark information, so that 1-bit watermark information is represented by a bit sequence of length cr. cr, also known as chip rate, is a major element in measuring the resilience of a watermark to various attacks: the larger the expansion factor, the stronger the robustness of the watermark, but at the same time the amount of watermark information that the host signal can carry Therefore, the selection of the expansion factor requires a balance between various factors such as the robustness of the watermark and the amount of watermark embedded [7].

For the bit sequence of length cr, use a quasi-random sequence of the same length for modulation, where:

$$p_i \in \{1,1\}, i = 0,1,...,cr-1 \quad (4)$$

It can be generated by a key-controlled pseudo-random number generator. The result of modulation is quasi-random order:

$$b \cdot p_0, b \cdot p_1, ..., b \cdot p_{cr-1} \tag{5}$$

Using ordinary addition, adding the watermark signal sequence to the host signal, the hidden signal S is obtained:

$$s_i = h + \alpha \cdot b \cdot p_i, i = 0,1,...,cr-1 \tag{6}$$

(1) Watermark extraction

Some watermarking schemes require the original host signal when extracting watermarks. These schemes are called non-blind watermarking. Conversely, schemes that do not require the original host signal for watermarking extraction are called blind watermarks, also known as forgetful watermarks. Some spread spectrum watermarks are non-blind watermarks, but more are blind watermarks [8].

$$cor(P, X^*) = \frac{1}{cr} P \bullet X^* = \frac{1}{cr} \sum_{cr}^{1} p_i \cdot (\alpha \cdot b \cdot p_i + e_i) = \alpha \cdot b + \frac{1}{cr} \sum_{i=0}^{cr-1} p_i e_i \tag{7}$$

Where • represents the dot product of the vector. The watermark extraction is based on the assumption that the pseudo-random sequence P and the distorted signal E are statistically independent, so that the value of the second term on the right side of the above formula is close to 0, thus:

$$cor(P, X^*) = \alpha \cdot b + \frac{1}{cr} \sum_{i=0}^{cr-1} p_i e_i \approx \alpha \cdot b \tag{8}$$

In this way, the embedded bit information is extracted [9].

2.2. VR Technology Algorithm

Documentary Review method. This paper has gathered and arranged a wide range of relevant papers. Anticipated sources from the areas of VR skills and education were discussed to help build the synthesis of the knowledge base presented in the article.

Descriptive research method: describe the development of VR technology and the characteristics of VR equipment. And combined with relevant knowledge to comprehensively analyze the teaching cases of VR technology in practice [10].

Exploratory research method: Using knowledge in the field of virtual reality technology and analyzing the advantages of actual teaching case summary, we propose a targeted desktop virtual reality curriculum construction plan. And use software to display it in VR.

Evaluation research method: Analyze and evaluate the achievement of the objectives of this research design. In order to verify the impact of the virtual experiment system on students' learning, the virtual experiment was purposefully applied to the actual learning process, and students' feedback data was collected through questionnaires and interviews, and the use of VR technology in experimental teaching was discussed on the basis of statistical analysis. Feasibility [11].

2.3. Digital Multimedia Technology Methods

Literature analysis method: After determining the research direction, use the literature data analysis method to read a large number of relevant education and teaching theory books and pedagogy theory journals and papers; and collect relevant materials to summarize and organize them; observe excellent music teaching examples; collect materials And data, sum up experience and organize and record.

Interview communication method: By exploring the current state of adoption of multimedia skills in school musically appreciation lessons, using the method of interview communication to understand the actual effects and actual problems of the adoption of multimedia skills in teaching, organize and summarize, and support the research results.

Exemplary method: Enumerate examples of the application of multimedia technology in music appreciation teaching to prove how multimedia technology is effective in music classroom teaching. And practice in teaching, use multimedia skills for classroom instruction, and test the validity of the research results [12].

Field research method: in-depth multimedia experimental learning classroom, analysis of the reality of the project and remaining challenges of multimedia teaching system experiments. Mainly enter the classroom of multimedia system experiment teaching, learn the teacher's teaching methods In the laboratory classroom, analyse how students perform during experiments, and learn about their learning difficulties, etc., so as to determine the focus of the graduation project [13].

3. Multimedia VR Technology Dulcimer Teaching Experiment

3.1. Composition of Multimedia Dulcimer Teaching System

(1) Hardware composition of multimedia dulcimer teaching system

The equipment of the multimedia dulcimer teaching system is mainly composed of a front-end signal system computer, a video screen base and a terminal imaging system headlights, monitors, monitors, sound system power amplifiers, speakers, microphones, electronic synthesizers and other equipment, forming A complete set of video, sound teaching system, animation, text and other media expression teaching system [14].

Among them, the computer can copy, process and modify media information, such as text, graphics, images, sounds, cartoons and movies. The display system can clearly display the information processed by the computer, so that more people can see all kinds of text and image information at the same time. The sound system amplifies the power of the sound signal, and then transmits it to the speaker for sound. The electronic composer inputs the dulcimer music information played by the keyboard into the computer, performs high-quality service functions, and is connected to the computer through the electronic composer to produce multi-timbre and multi-chord sounds.

(2) Software composition of multimedia music teaching system

Using Word 2003, you can input text, images, scores and other content on the computer through the keyboard or scanner. Then, you can use the software to process the text according to our needs, enlarge the image and get some special effects. Through the software, you can input images, sounds and other files in the text file, or you can input a reduced icon in the text file, and use the icon to display the audio file or image, so when you need it, you only need to use the mouse to lightly Click this icon, you can see the content of the image file or listen to the sound content in the

audio file [15].

Powerpoint software has been widely used in the education system. In the production of multimedia software, its application occupies an absolute dominant position. It is characterized by the production and presentation of multimedia. He gave a speech similar to a speech. The manuscript is dynamic, and various multimedia elements such as text, graphics, images, sound, movies, and television can be inserted into this presentation. The software is simple, does not require high students, and is easy to use. The content of the book is converted into teaching transparency and then appears on the big screen. This software has been widely used by educators.

Cakewalk is a synthesis software, also known as sequence software. The function of the synthesis software is to record these notes in the form of digital signals as the composer plays on the keyboard, and use the form of music. After the score is released, the composer can perform various processing processes on the score at will, such as deleting, replacing, and assembling. The software can also be used to create one or more voice music, and it can also use multiple timbres in the production process [16].

3.2. Establishment of VR Technology Art Design Teaching Model

Open the drawing software and draw the basic spline of the product, focusing on the basic structure of the product. RHINO 5.0 comes with a package that constructs curved shapes with the help of lines, poles and sections. The quality of the spline (structure) line also determines the quality of the generated surface. The cord work should be keeping it as brief as possible, reducing the number of architectural dots, and having both ends synchronised and even.

Generates a screen to generate a single curved surface with a guaranteed good level of precision spline. The majority of the order is a two-track system for constraining the full form of the screen.The lens part adopts the split command to complete the remaining surface. Check the degree of integration of the curved surface on the mirror body, and then use the curved surface fillet command to reduce the abruptness of the modeling so that the rounded modeling trend is the main place where the vision needs attention [17].

Lastly flesh out the details of the model. To begin with, build a visual prediction, use the extrusion command and the fillet command. Finally, check whether the surface is missing and divide the layers, and divide the different shapes and surfaces into different layers.

The teaching model is established by the KeyShotVR function, open the software and click on KeyShotVR, select the sphere (rotate in 360 degrees to view every detail of the product in detail)-take the object as the center of rotation-the initial interface settings are adjusted to the scale of the perfect display of the teaching equipment Either way, the smoothness control will pop up later. Smoothness control has two parameter controls: horizontal frame and vertical frame. The larger the value, the smoother the smoothness. The value is proportional to the level of smoothness. The parameter should be as high as possible, and the KeyShotVR file generated later will interact smoothly. However, its rendering time has also increased substantially. Continue to click forward and the KeyShotVR output interface will pop up. The resolution parameter should be adjusted as high as possible (it will also increase the rendering time) [18].

4. Digital Multimedia VR Technology Music Teaching Analysis

4.1. Analysis of Digital Multimedia Watermarking Technology

The three images are analyzed, and the relationship between their forged bits and the forged power is shown in Table 1:

Table 1. The relationship between forged bits and forged power

Attributes	1	3	5	7	9	11
Lena	1	1	1	0.9	0.9	0.8
Airplane	1	1	0.8	0.9	0.7	0.8
Splash	1	1	0.9	0.8	0.7	0.6

From the above comparative experiments, it can be found that the second attack method has achieved better results in terms of the success rate of forgery and the number of forged bits (note that the scales of the coordinate axes of the two pictures are different). This is because the first attack method is to forge in segments, which does not make full utilization of mechanical attributes of the received signals s; and the second attack method employed the summary properties of the received signals s, so a better forgery effect can be achieved. Note that the statistical characteristics of the relationship mentioned here do not refer to correlation, on the contrary, statistical independence can also be used [19].

Analyzing the code rate after embedding the watermark, the length of the selected synchronization code and characteristic code are both 8, which is one byte. For Coastguard, synchronization and byte alignment are performed 32 times, and the average interval between two synchronizations and byte alignments (the number of DCT blocks) is 220, and a total of 131 bits are lost for byte alignment, with an average of 4.09 bits each time; Foreman, synchronization and byte alignment are performed 25 times, the average interval between two synchronizations and byte alignment (the number of DCT blocks) is 285, a total of 89 bits are lost for byte alignment, and an average of 3.56 bits each time. The interval between each synchronization and byte alignment is shown in Figure 1:
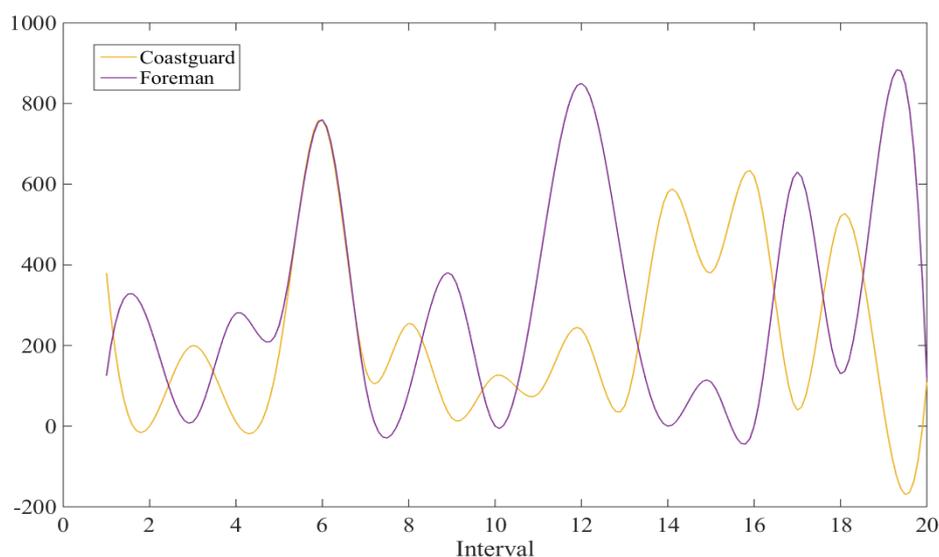

Figure 1.The interval between two synchronizations and byte alignment

When the video is playing, it is often necessary to jump to a certain position in the video. In this case, it should be able to detect the watermark in time. At the same time, we also need to make the watermark information drop frames or a certain VOP. After that, it can still be detected. We realize the real-time detection of watermark according to the relative stability of the DC coefficient. When the watermark is embedded, the recently processed DC coefficients are recorded, a feature value is generated from the DC coefficient according to a user key, and the watermark bit byte alignment and synchronization processing are performed through the value of the feature value. In the watermark detection, the feature code is also generated, and the byte alignment and synchronization processing are performed according to the feature value. The robustness of the DC coefficient ensures that the same feature value can be obtained when the watermark is embedded and extracted. Experimental results show that using the feature value synchronization method, we can detect the correct watermark information in a short time (not more than a few seconds) from any position in the video.

4.2. Analysis of VR Technology Teaching Mode

VR instruction is a large-scale sector. Just as other sectors, VR instruction carries its own strands of activity. the manufacturing model of VR instruction as such can be described as follows: (1) VR metal exploitation raising the bar for more detailed interaction with the equipment. (2) Research and development of VR teaching software and systems. (3) Research and development of VR instructional components and elements. (4) VR instructional materials can be accessed from a corporate environment for the purpose of resource exchange and technological advancement. At present, VR teaching production is in its infancy, and there is a huge room for improvement in each link. To join any production mode, you need to have a detailed understanding of it. Once the exact production mode ring is selected

Section, you need to innovate in the practical application of VR teaching projects. The current development of VR technology teaching mode is shown in Figure 2:
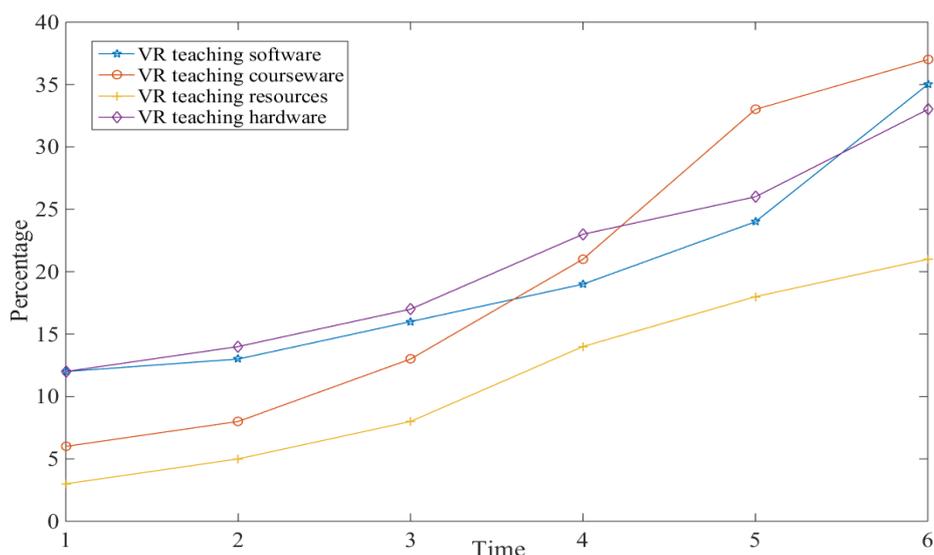

Figure 2. The development status of VR technology teaching mode

It can be seen from the figure that the VR teaching mode is showing an upward trend, which reflects that the VR teaching mode is the future development trend. Among them, the development of VR teaching courses and systems has the largest upward trend, increasing from 6% to 38%. As for VR teaching resources, its growth rate is the slowest, increasing from 4% to 21%.

Some practical analyses are put forward for VR teaching. (1) The idea of using VR for live remote teaching. (2) Focusing on the subdivision of teaching professions, and creating tailored teaching content on specific professions, such as technology Such colleges and universities provide VR tutorials for professional skills training. (3) Specialising in acquiring and developing languages and skills. For example, English acquisition, motoring education, etc. (4) Divided from the time period of teaching, they are classified into initiation level, secondary level, professional academy, etc. For example, preschool educational programs such as virtual map teaching and curriculum of geography field diffusion. The instructional goals of it differ for each VR instructional course. Therefore, the instructional effect produced will also be diverse.

There are many goals for VR technology in the teaching field to be discussed. No one will deny the application of VR+ teaching. But which of these are necessary and which are pseudo-needs require our rational thinking. In the end, VR+ teaching should achieve results consistent with or even more results of realistic high-quality teaching[20]. Failure to achieve high-quality teaching results indicates that there are errors in virtual reality teaching technology, and there is a strong need to modify and refine VR instructional skills. Thus, VR technology is a debatable new instructional and educational tool. At this stage, the use of VR technology in pedagogy may generate good pedagogical results or may not be very useful. These depend on the development of the software, the interactive experience of the equipment and the teacher's lesson Comprehensive factors such as the content setting of the process.

4.3. Analysis of Dulcimer Teaching Mode

This article analyzes the results of 100 student questionnaires, and the results are shown in Table 2. Each student can choose multiple dulcimer teaching modes.

Table 2. Dulcimer teaching models expected by students

Cassification	A	B	C	D	E	F	G
Number of student	60	40	20	25	27	11	8
The proportion	60%	40%	20%	25%	27%	11%	8%

It can be seen from the table that students choose A. Choose to listen to dulcimer songs or other forms of musical participation, accounting for 60% of the total, choose B. To listen to dulcimer music quietly, calculation representsr 40% of the total; C. 20 people who listen to dulcimer music while listening to the teacher's explanation, calculation represents 20% of the total; 25 people who choose D. to learn to play dulcimer, calculation represents 25% of the total; 27 people who choose E. to learn dulcimer-related knowledge, calculation represents 27% of the total ; 11 people who choose F. to create dulcimer music activities, calculation represents 11% of the total; 8 people who choose G. dulcimer music games, calculation represents 8% of the total. From a comprehensive analysis, students most agree with the teaching mode of

dulcimer playing while singing or participating in other forms, and least agree with the teaching mode of dulcimer games. The more intuitive effect is shown in Figure 3:
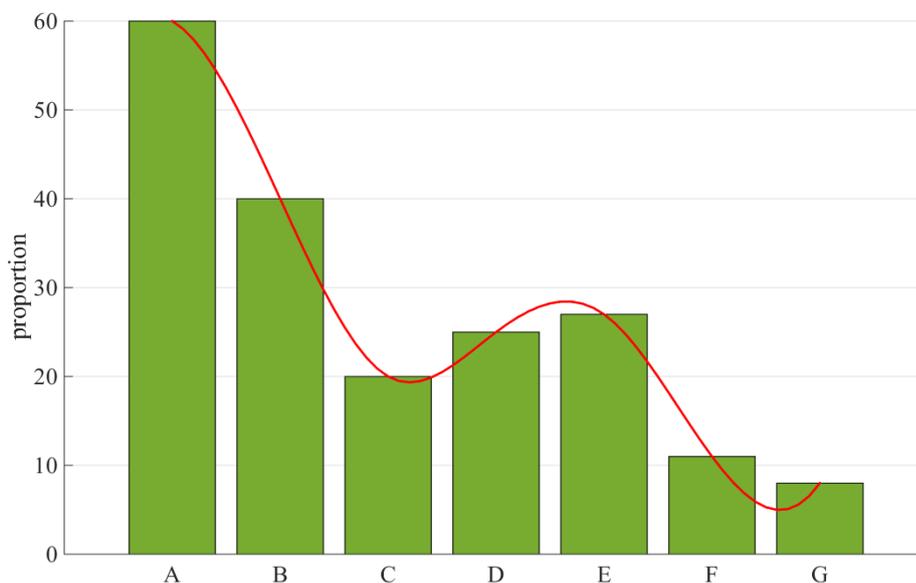

Figure 3. The proportion of dulcimer teaching models expected by students

Teachers create a good teaching atmosphere in classroom teaching, which can effectively improve students' curiosity and interest in dulcimer and attract students' attention. Once students are interested in dulcimer, they will adopt a more active attitude towards learning and will be more proactive in learning. Therefore, teachers should pay attention to creating a good teaching environment to better attract students and stimulate students' enthusiasm to learn dulcimer. Interest is the best teacher. Teachers must scientifically develop the application of multimedia technology and strive to create a sound learning environment for teachers. The application of multimedia technology can effectively enhance the time and space effects of dulcimer music, and can play a very good role in stimulating students' emotions in dulcimer learning. The use of multimedia teaching methods can reveal the concept of musical works, deepen students' understanding of dulcimer works, and encourage students to find outstanding dulcimer works from students. In the multimedia teaching environment, students will gradually discover and appreciate beauty, and improve their aesthetic ability. This also makes students more willing to choose music teaching while playing and singing.

4.4. Analysis of Dulcimer Teaching Effect under Digital Multimedia VR Technology

This paper concludes the comments of 100 students on the instruction of the dulcimer with modern computer VR system. The evaluation suggests that 36 out of 100 students, representing 41% of the total, were very pleased with the instruction of the dulcimer with electronic streaming VR equipment, and 45 were basically pleased with the instruction of the dulcimer with numerical multimedia VR technics, calculation represents 45% of the total. Of these, 8% were unsure about instruction of the dulcimer with electronic digital multimedia VR enabled devices. Only 4% were dissatisfied with the instruction of the dulcimer with modern computer VR systems.

Finally, only 2% were dissatisfied with the education of the dulcimer with modern computer VR systems. The detailed outcomes are illustrated in Figure 4:
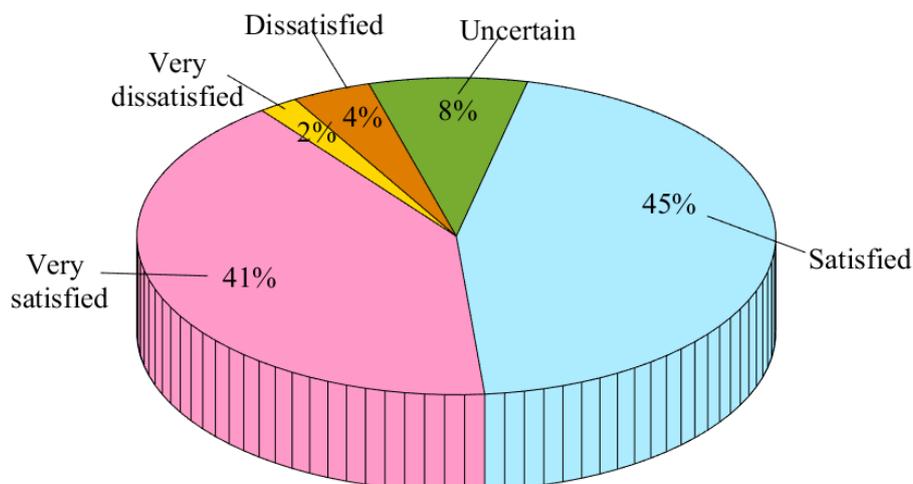

Figure 4. Students' evaluation of dulcimer teaching

The application of digital multimedia technology to dulcimer teaching broadens the learning channels and learning environment of students, thereby promoting students' interest in learning. In dulcimer teaching, the learning of a single music theory knowledge often makes people feel boring, which makes students lose interest in the knowledge taught in the classroom, leading to inattention in the classroom. After digital multimedia technology is applied to dulcimer teaching, in order to stimulate students' interest in learning, dulcimer teachers can use multimedia to improve the classroom atmosphere during class, create various teaching scenarios for students, and enable students to make continuous progress in a happy classroom. This makes students have a high evaluation of dulcimer teaching.

5. Conclusion

This paper focuses on the implementation of VR technic in the instruction of dulcimer. Following the investigation of the technical features of VR technology and the practical instructional samples, virtual desktop technology intervenes in the concept, teaching purpose and content of the experimental modeling course and expounds the teaching structure and teaching methods. Finally, it summarises the technical tools for teaching VR on tabletop machines, creating VR tabletops for them and having them appear in the VR of the lecture room. In the future, VR technology will be the most critical teaching technology. Music teaching requires students to analyze the three-dimensional space independently, and the use of VR technology can achieve its purpose.

This article analyzes the necessity of multimedia application in junior middle school dulcimer education in our country and the advantages of this educational method by referring to multiple related documents on the multimedia dulcimer education system, and analyzes the education of other applications in dulcimer education. The incomparable advantages of this method improve the efficiency of education. As a new educational tool, multimedia has revolutionized the dulcimer

education of middle school students. This greatly stimulated students' interest in dulcimer learning, cultivated students' aesthetic sense, and realized their all-round development.

This article investigates a number of related documents of the multimedia dulcimer education system, analyzes the necessity of multimedia application in school dulcimer education in our country and the advantages of teaching methods, and explains its application in dulcimer education. Through this method, the advantages and educational effects are greatly improved. As a new educational tool, multimedia has had a revolutionary impact on high school dulcimer education. It greatly stimulates students' interest in dulcimer learning, cultivates students' beauty, improves students' awareness, and achieves all-round development.

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