

Research Article

Multimedia video recording assisted teaching method based on innovation strategies and VR technology

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ABSTRACT

In order to make computer-aided teaching technology better applied in teaching, a multimedia video recording assisted teaching method based on VR technology is proposed. Based on the analysis of teaching video processing, the unique immersion and interactive characteristics are brought by virtual reality technology. Based on the modern intellectual property of innovation strategies, the multimedia video recording assisted teaching model is constructed to optimize the data processing function and structure of multimedia video teaching system. Optimize the evaluation index and evaluation algorithm of multimedia video recording assisted instruction, so as to realize the optimization of multimedia video assisted instruction method. Finally, the experiment proves that the multimedia video recording assisted instruction method based on VR technology has high practicability in the process of practical application and fully meets the research requirements.

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Keywords: VR technology; Multi-Media; Video recording; Auxiliary teaching;

INTRODUCTION

Internet assisted instruction has been utilized in many fields since the introduction of the Internet and information technology[1]. This causes the uniqueness of instructional strategies, which are characterized by the combination of perception and rationality. As a result, Internet technology may be used to facilitate teaching preparation, teaching process, and engagement with teachers [2]. The virtual reality-based teaching system virtualizes instructor resources and teaching environment

resources, making resource utilization more easy and optimizing resource utilization innovation strategies [3]. Create a learning environment using virtual reality technology's unique participation, interactivity, and creativity. The advancement of technology has opened the doors of innovation strategies for the world. With help of technology, any field can make progress. The most important use of technology is in the field of education. In the present world, the use of technology and science is common in the field of education. Teachers all over the world use modern technology for teaching the youth. By using technology teachers' teaching methodology and

students' learning process becomes easy. in the world of technology old and traditional teaching methods cannot be used because the old methods cannot explain as much as the new and innovative strategies and technology can explain.in various countries, online teaching platforms have been established to speed up the process of modern education. Many universities and other educational institutes use multimedia and other forms of technology to teach their students the best knowledge. In the past, the resources for teaching the students the new and advanced knowledge were limited but in the present world due to the unlimited advancement in the field of science, the resources have been improved so is the teaching methodology. in the past teachers were unable to provide the proper guidance to the students due to the lack of proper teaching methodology but now teachers use modern technology to teach their students the new concepts.in the new teaching methodology, teachers use video technology to teach the students about a particular subject using video lectures. When students learn through by seeing the objects they learn more. Virtual technology is also used by teachers during their teaching period to teach the students using the innovative strategies. A three-dimensional image of an object can be made using virtual technology. The 3D virtual reality technology is such a unique technology that makes a person feel that the object he is seeing is there in reality[1]. The virtual reality technologies based on the artificial intelligence. This intelligence based system provides the knowledge in a form that is easy to comprehend by human brain .So, teaching with help of modern technology has become

easy with virtual reality technology.

1 Multimedia video recording assisted teaching method

1.1 Construction of multimedia video recording assisted teaching model

The video-recorded lectures are very good for teaching the students about a particular subject. the video lectures assist the teaching methodology and present innovative strategies. students can watch the recorded lectures of any subject again and again if they want to also, virtual reality technology helps the students to broaden their vision. Virtual reality technology establishes an artificially constructed three-dimensional virtual environment. Users interact and influence objects in the virtual environment in a natural way, which expands humans' ability to understand, simulate and adapt to the world [4-5]. By carrying out video assisted teaching in the classroom, teachers play more video animation related to the reality of students' lives. It has deepened the understanding of some phenomena in life and strengthened the ability to use knowledge [6]. The teaching system provides a variety of learning services, online guidance, virtual environment learning and intelligent evaluation. In order to realize its functions, the whole platform adopts a five-tier architecture, from bottom to top: access layer, data processing layer, data storage layer, scene management layer and application layer, as shown in the figure 1.

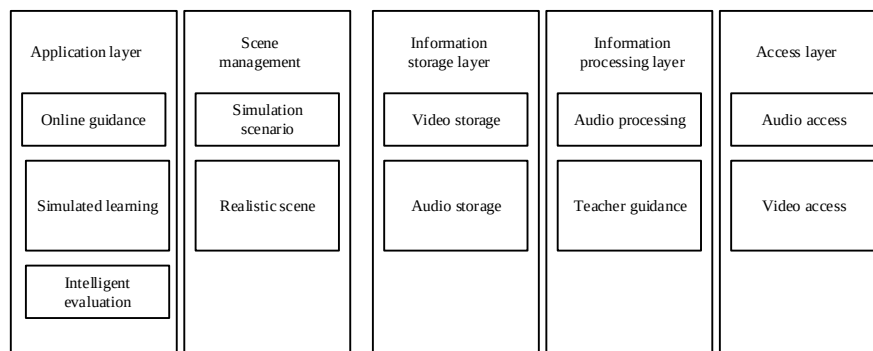


Fig. 1 Data processing function structure of multimedia video teaching system

Data mining is only a step in KDD. It mainly uses some specific knowledge discovery algorithms to discover relevant knowledge from data within the limitation of certain operation efficiency [7]. At present, most of the research focuses on data mining algorithms and

applications. People often do not strictly distinguish between data mining and knowledge discovery in database. It is generally called KDD in the field of scientific research and data mining in the field of engineering.

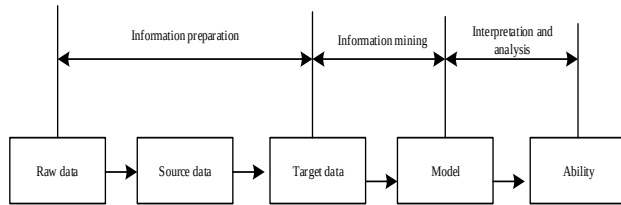


Figure 2. Teaching management information mining process.

The effectiveness of information requires that the mined data be carefully checked before mining [8]. Only by ensuring the effectiveness of information (or data) can the effectiveness of the mined information be guaranteed. The most important thing is that the information obtained is practical, that is, the information

or knowledge is effective, practical and realizable for the business or research field discussed [9]. For video, it can effectively improve the efficiency of class. Today's teachers, the application of video reduces the writing of blackboard writing and saves time. Multimedia video assisted instruction system is a practical, easy-to-use, reliable and low-cost multimedia video assisted instruction system for primary and secondary schools. It is used as a platform for distance learning for primary and secondary schools and even network education colleges [10]. Multimedia video assisted instruction system provides interactive practice, self-test, simulated examination, courseware on demand, question answering, learning communication, virtual experiment and learning archives including image, sound, animation and video. The working principle of the system is shown in the figure 3 below.

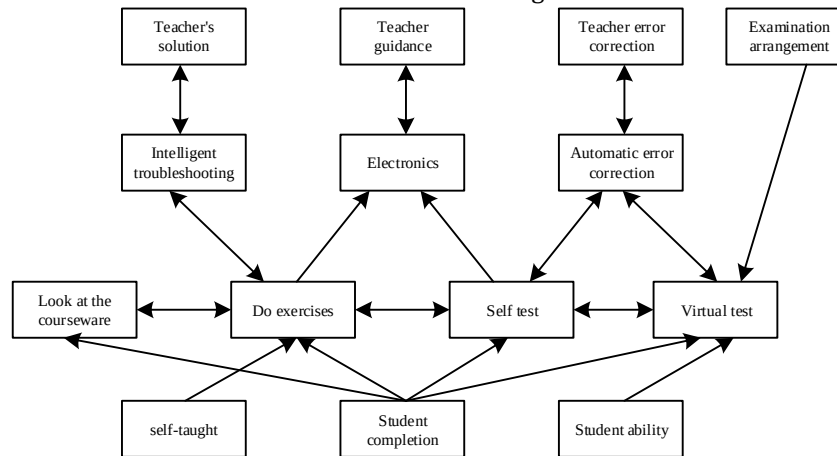


Figure 3: Module and function of multimedia teaching system

During this period, students can take notes carefully for fear of missing the content. In addition, students can write while listening while watching. That is, they can see, hand, ear and heart. Therefore, in the whole process of class, their attention is highly focused. If the courseware is too "vivid", it will often distract students' minds. Therefore, video should be properly used in teaching. For videos, the more is not the better [11]. They are designed according to students' characteristics and cognitive laws. Videos should be pleasant to inspire students' cognition and thinking. Video computer includes all the functions of video and hypermedia. In teaching, the use of video can improve teaching more or less, but this is not a good use of video. We still need to think about some things, that is, under what conditions and how to use them appropriately, rather than abuse them everywhere [12]. The video serving classroom teaching should show the effect of its use. When using courseware according to the actual situation, only in this way can we pay attention to the effect.

1.2 Evaluation algorithm of multimedia video recording assisted instruction

The evaluation algorithm method is used for evaluating the working of multimedia video recording. The multimedia video recording system assists the teachers in providing the students with the related instructions. These instructions will in turn make the learning process easy for students using the multimedia video recording. The main purpose of multimedia video recording programs is to help the students in the educational field but through the innovation strategies the virtual educational evaluation has been a controversial field for a long time. People try to measure it accurately through various methods and produce a variety of different measurement systems in the research process. However, due to the strong subjectivity of the previous measurement standards, people cannot reach a consensus on various evaluation systems, and then there is no unified measurement standard. In recent years, people have used mathematical methods

to study the education evaluation system, and got many valuable results. Among them, they mainly use mathematical and physical tools for modeling research [13]. The common methods are fuzzy mathematics, mathematical statistics, cybernetics, linear programming, computer technology and so on. Among them, fuzzy mathematics method is most widely used in the field of evaluation. A large number of theoretical research and practical tests have proved the accuracy and reliability of fuzzy mathematics. The characteristics of fuzzy mathematics make its description of regular phenomena have natural advantages and become a powerful tool in the evaluation system [14]. The basic process of the fuzzy comprehensive evaluation method is shown in the figure 4 below.

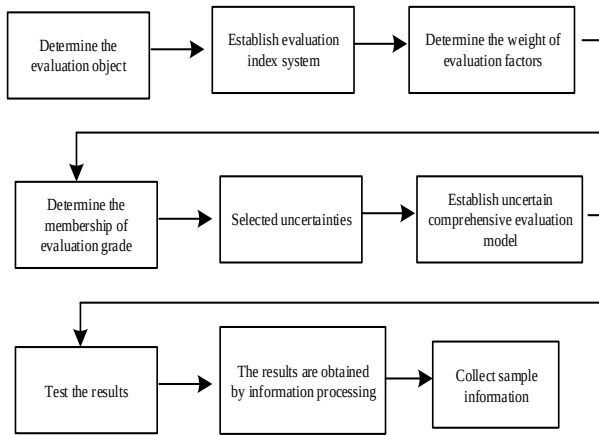


Fig. 4 Basic process of fuzzy comprehensive evaluation method

Further determine the set of evaluation factors, expressed by the following formula.

$$U = \{u_1, u_2, \dots, u_m\} \quad (1)$$

Where $u_i=1,2,\dots,m$ is the evaluation factor, and m is the number of single factors at the same level. This set constitutes the evaluation framework, and the evaluation result set is determined and expressed by the following formula.

$$V = \{v_1, v_2, \dots, v_n\} \quad (2)$$

Where $v_j=1,2,\dots,n$ is the evaluation result, and N is the number of elements, that is, the number of grades or the number of comment files. This set specifies the selection range of evaluation results of a certain evaluation factor [15]. The elements of the result set can be qualitative or quantitative scores. Suppose that for the first evaluation factor u , a single factor evaluation is carried out to obtain a fuzzy vector relative to V :

$$R_i = (r_{i1}, r_{i2}, \dots, r_{in}), i=1, 2, \dots, m; j=1, 2, \dots, n$$

(3)

Determine the weight set w , expressed by:

$$W = (w_1, w_2, \dots, w_n) \quad (4)$$

Where $w_i = 1,2,\dots, n$ represents the importance of factor $u = 1,2,\dots, n$, that is, the weight assigned to $u_i = 1,2,\dots, N$, which satisfies the formula:

$$\sum_{i=1}^n w_i = 1, 0 \leq w_i \leq 1 \quad (5)$$

The combination of weight vector a and judgment matrix R is the final evaluation result of the object, as shown in formula

$$B = W \cdot R = (b_1, b_2, \dots, b_n) \quad (6)$$

And meet:

$$b_j = \sum_{i=1}^n w_i \cdot R_{ij}, j=1, 2, \dots, n \quad (7)$$

Further establish factor class weight set a . According to the importance of various factors, each factor category is given corresponding weight. Let the weight of type I factor $u_{i1} = 1,2,\dots, i$. And I is $w_i = 1,2,\dots,i$, then the weight set of this factor type is the following formula:

$$A = (w_1, w_2, \dots, w_n) \quad (8)$$

Further establish factor weight set a . In each type of element, each factor is given a corresponding weight according to the importance of each factor [16]. Let the weight of the j -th factor in class I be w_{ij} , $I = 1,2,\dots, l$, $j = 1,2,\dots, m$, then the factor weight set is expressed by equation.

$$A_i = (w_{i1}, w_{i2}, \dots, w_{im}), i=1, 2, \dots, l \quad (9)$$

This step has the same meaning as the establishment of evaluation result set in single-level fuzzy comprehensive evaluation. Conduct comprehensive evaluation according to various factors in a certain category. Let $J = 1,2,\dots, m$ elements in class $I = 1,2,\dots, n$ be comprehensively evaluated, and the evaluation object belongs to $KK = 1,2,\dots, n$ elements in the evaluation result, and the membership degree is $r_{ij} = 1,2,\dots, L$, $j = 1,2,\dots, m$; $K = 1,2,\dots, N$, then the single factor membership matrix of the comprehensive evaluation is expressed by the formula:

$$R_i = \begin{pmatrix} r_{i1} & r_{i12} & \dots & r_{ik} \\ r_{i21} & r_{i22} & \dots & r_{i2k} \\ \dots & \dots & \dots & \dots \\ r_{im1} & r_{im2} & \dots & r_{imk} \end{pmatrix}, i=1, 2, \dots, l \quad (10)$$

Therefore, the fuzzy comprehensive evaluation matrix of class I , $I=1, 2,\dots, n$ factors is

$$\begin{aligned}
B_i &= A_i R_i \\
&= (w_{i1} \quad w_{i2}, \dots, w_{im}) \begin{pmatrix} r_{i11} & r_{i12} & \dots & r_{i1k} \\ r_{i21} & r_{i22} & \dots & r_{i2k} \\ \dots & \dots & \dots & \dots \\ r_{im1} & r_{im2} & \dots & r_{imk} \end{pmatrix} \\
&= (b_{i1} \quad b_{i2} \quad \dots \quad b_{im}), i = 1, 2, \dots, n
\end{aligned} \tag{11}$$

Learning from the research experience and successful cases at home and abroad, discussing and studying with experts, listening to expert opinions, and comprehensively analyzing the factors affecting multimedia teaching ^[17]. According to the basic

principles of the construction of the evaluation index system, as well as the above "double main" teaching design process, multimedia teaching system factors and multiple evaluation theory, a multimedia teaching fuzzy comprehensive evaluation index system is designed ^[18]. Based on the above analysis, the characteristics of multimedia teaching mentioned in this paper can be divided into six parts: the evaluation of teachers' behavior, the evaluation of students' behavior, the evaluation of teaching effect, the evaluation of teaching courseware, the evaluation of hardware platform management, and the evaluation of system management technicians. See the table for details.

Table 1. Fuzzy comprehensive evaluation index system of multimedia teaching

Primary index	Secondary index	Tertiary indicators
Teacher behavior	Teaching objectives	The teaching goal is clear, can be connected with specific activity contents and methods, has strong awareness, and can regulate teaching from the goal.
	Textbook understanding	Clarify the internal relationship of learning and the docking point of new content.
	Content of courses	It meets the requirements of the outline, has a certain depth and breadth of content, has clear views, highlights key points, solves difficulties and is clear in organization.
	Teaching media selection	The media selection is correct, the media category is determined for different disciplines, and the traditional and multimedia teaching are combined.
	Teaching structure	The division of teaching links is reasonable and the logical connection of each link is appropriate.

The lowest fuzzy comprehensive evaluation is only the synthesis of various factors in a certain category. In order to consider the comprehensive impact of various factors, the evaluation purpose refers to the objectives and requirements to be achieved in the evaluation activities, and is the premise and basis for formulating the evaluation objectives. In this, the evaluation purpose of multimedia teaching fuzzy comprehensive evaluation system is to let teachers and relevant staff know the advantages and disadvantages of their teaching and work according to the evaluation results, and can carry out teaching reflection according to the index requirements of multimedia teaching evaluation, so as to improve multimedia teaching activities. Multimedia teaching evaluation index system is to specify the evaluated factors and factor sets in multimedia teaching evaluation ^[19]. And the weight coefficient and evaluation standard of the index system. Multimedia teaching evaluation index system can objectively analyze the teaching effect, deeply understand the success or failure of each link of teaching, evaluate its success and existing problems, and make the teaching means more perfect ^[20]. It can effectively mobilize

teachers' enthusiasm for teaching, make teachers get fair evaluation, and help teachers change their teaching ideas. Finally, by means of objective evaluation, the purpose, quality and effect of the whole multimedia teaching activities can be displayed, the teaching process can be optimized and the teaching effect can be improved.

1.3 Implementation of innovation strategies in multimedia video recording assisted teaching

Implementation of innovative strategies and virtual reality technology in teaching methodology is the most important step. If the proper implementation is made, then this technology will assist the teaching staff. In the implementation process, it is necessary to make sure the information provided to the students with help of virtual reality is authentic and accurate. There are two types of media information. The original dual meaning of media refers to the entity storing information, such as magnetic disk, optical disk, magnetic tape, semiconductor memory, etc., which is often translated into media in Chinese; the second refers to the carrier transmitting information, such as digital, text, sound, graphics, etc., which is

translated into media in Chinese. In the subsequent discussion of relevant issues, this paper defines the concept of the media as the second understanding, that is, the intermediary of information exchange between people, in short, the information carrier. Because the most essential concept of information is the surface feature of the attribute of objective things, its expression is diverse. At present, there is no unified standard definition of multimedia concept. Corresponding to the concept of media, multimedia also includes dual meanings, that is, the synthesis of multiple information entities or the synthesis of multiple information carriers. When studying and discussing related issues, this paper defines the concept of multimedia as the second understanding: multimedia refers to an information carrier that combines two or more information types. The information types used include text, image, animation, sound, video and image. For the understanding of multimedia concept, see Figure 5:

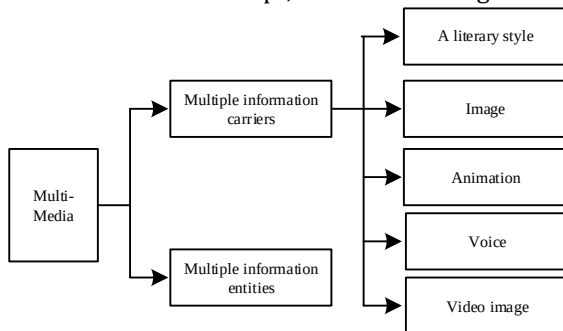


Figure 5. Multimedia video teaching concept

The research on evaluating multimedia video assisted instruction is not new. As early as 2003, the evaluation model of distance teaching based on Internet was proposed. The model divides multimedia video assisted instruction into several large parts or subsystems, and evaluates several aspects of each system, the evaluation level of the whole paper falls on the macro level, without the design of specific indicators and the combination with specific teaching system. The main part of the model is shown in figure 6 below

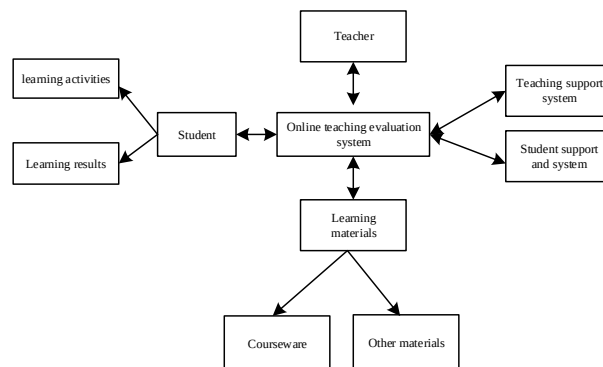


Figure 6. Evaluation model of multimedia video assisted instruction

In the process of multimedia assisted instruction, we need to choose those multimedia that can meet the curriculum requirements in terms of expressiveness and cognitive function according to the different teaching characteristics and teaching objectives of listening, speaking, reading and writing. First of all, the traditional print media is essential. It is still the most basic, convenient, economical and most suitable medium for people to study and study; Secondly, audio-visual and audio-visual media also play a vital role in teaching. If learners want to learn pure pronunciation and understand the real culture in their own country, they must obtain it through listening and seeing. Therefore, this kind of multimedia cannot be ignored; Third, computer and network media should be properly used according to the actual situation. Teachers and learners should be encouraged to interact in real-time and non-real-time through online timely messaging tools or E-M. Teachers and students are the two main bodies in teaching activities. Courseware plays a big role in the communication between teachers and students. Both teachers and students are the key factors in multimedia video assisted teaching and traditional classroom teaching. It is natural for them to become the evaluation object; Courseware is not commonly used in traditional classroom, but the transmission of teaching content in network classroom mainly depends on courseware, so this design takes teachers, students and courseware as the main object of evaluation. As shown in the figure 7 below:

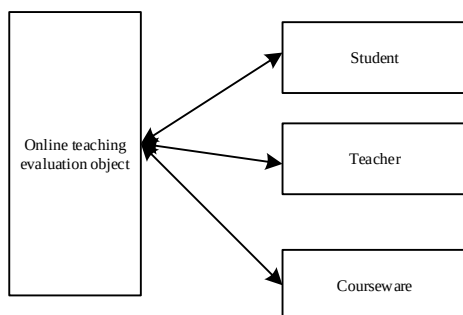


Fig. 7 Determination of teaching evaluation object
This record is more timely, more objective and more real. Through the analysis of the commonly used multimedia video assisted teaching system, the author puts forward some evaluation elements to help teachers and system developers. Combined with the application of the multimedia teaching system in Beiyou network education college, the author makes an evaluation from three directions: students, teachers and courseware. The author here takes the behavior statistics of the evaluation object of a course in a certain period of time as the unit. In the current application of multimedia assisted classroom. Make

full use of the image, integration and comprehensive advantages of multimedia technology, create a certain learning situation for students, create a vivid and realistic teaching atmosphere, and advocate students' independent discovery and learning in the situation. In addition, we can also consider extracurricular multimedia teaching, make extracurricular multimedia teaching software, or give classroom teaching software to students, so as to help students digest knowledge and methods that are not fully digested in the classroom and help students form ability. At the same time, make full use of network media, portable media and digital TV to educate students to create an extracurricular multimedia learning environment, improve students' learning interests and consolidate learning results.

2 Analysis of experimental results

The basic idea of this experimental course is to gradually introduce multimedia elements and verify the application effect of multimedia in secondary school auxiliary teaching through the comparison of teaching effect. It is divided into five teaching steps, as shown in the table 2 below.

Table 2. Teaching scheme of experimental course

Mathematical stage	New multimedia elements	Multimedia mode	Teaching output
a	AC sound	Image sound	Exercise in class and self-assessment
b	Set sound	Image sound	Exercise in class and self-assessment
c	Picture	PPT	Exercise in class and self-assessment
d	Image	Cool video clips	Exercise in class and self-assessment
e	Text	Word	Exercise in class and self-assessment

As the carrier of information, the symbol system used by different multimedia to carry information is different. In the teaching process, the teaching mode can be divided into three categories: oral, written and printed text symbols, also known as number sequence symbols. Shape symbol: including pictures, charts, maps, etc. It is an abstract symbol of practical things.

Analog symbols: include and action symbols. Analog symbols are divided into visual analog symbols and auditory analog symbols. Shape symbols and analog symbols are also called non symbols. Based on the above three types of symbol systems, this paper analyzes the symbols and stimulated senses used in common teaching multimedia.

Table 3 Symbol system analysis of common multimedia teaching

Symbol					
	Media	Graphic symbols	Linguistic symbols	Symbol	Sensory perception
Classroom multimedia	Video media	√	√	√	Vision and hearing
	Music Media		√	√	Hearing
	PPT	√	√	√	Vision and hearing
	CD Software	√	√	√	Vision and hearing

Extracurricular media	Electronic text	√	√		Vision
	Network media	√	√	√	Vision and hearing
	Portable media	√	√	√	Vision and hearing
	Digital television	√	√	√	Vision and hearing

From table 3 that all kinds of teaching multimedia use different symbols to carry information and stimulate the different senses of the receiver, and their teaching functions and characteristics are not exactly the same.

According to the different teaching objectives and teaching characteristics of single teaching, this paper analyzes the common application modes of multimedia assisted teaching, as shown in the table 4.

Table 4 Application modes of common multimedia assisted instruction

Media mode Application site	Video	Song	PPT	CD	E-text	Internet	Portable media
Create situations and arouse motivation	√	√	√	√	√	√	-
For example, construction concept	√	-	-	-	√	√	√
For a demonstration,	√	-	-	√	-	√	-
Trigger thinking	√	√	√	-	√	-	√
Summarize and consolidate	√	-	-	√	-	√	√

From table 4, there are great differences in the application modes of common multimedia forms in secondary school auxiliary teaching. On the whole, the multimedia including video and image plays a prominent role in the perceptual cognition stage and consolidation cognition stage of scene presentation, the multimedia including text and sound plays a prominent role in the rational cognition and practical cognition stage, and the extracurricular multimedia form is mainly used in the extracurricular review consolidation stage. Based on the results of table analysis, multimedia can be used as a reference for auxiliary teaching. In this multimedia assisted instruction experimental course, the objective evaluation of students' learning effect mainly uses the average accuracy of the whole class of the in class exercises set in the classroom materials (see Annex A) as the evaluation index. According to the data analysis results collected after class, the accuracy curve of in class practice is given, that is, the change curve of in class practice accuracy with the five stages of teaching in this experimental class, as shown in the figure 8.

From figure 8 that the accuracy rate of classroom practice continues to improve with the advancement of the teaching stage, and the accuracy rate increases the most. It corresponds to the teaching stage of introducing picture media and video media respectively. It can be seen that the introduction of

these two media have played a great role in students' mastery of listening content, and students' self-evaluation.

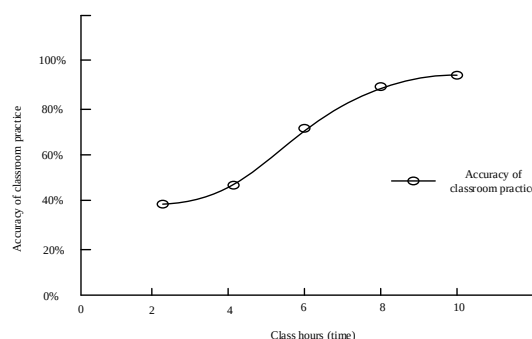


Fig. 8 Accuracy curve of classroom practice under assisted instruction

In this multimedia-assisted instruction experimental class, the student self-assessment of learning effect mainly uses the student self-assessment set in the classroom materials as the data source. See Annex A. students are required to self-assess their self-mastery at the end of each stage and give the percentage of self-assessment. According to the data analysis results collected after class, the student self-evaluation curve is given, that is, the change curve of the average percentage of student

self-evaluation with the teaching stages of this experimental class, as shown in figure 9.

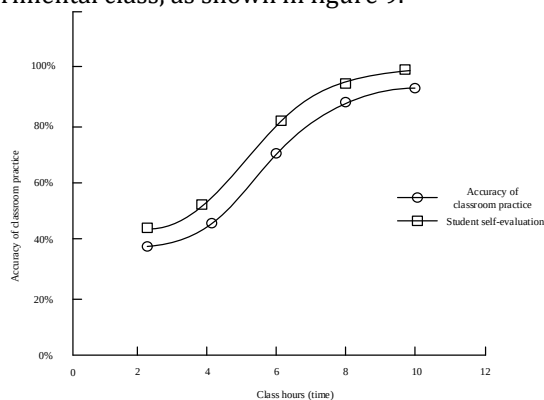


Fig. 9 Comparison between students' self-evaluation curve and accuracy curve of classroom practice

From figure 9, the percentage curve of students' self-evaluation and the accuracy curve of classroom practice are generally consistent with the changes in teaching stage, and the accuracy of students' self-evaluation is slightly higher than that of classroom practice. In the students' self-evaluation curve, the increase in mastery percentage is the largest, corresponding to the teaching stage of introducing picture media and video media respectively. From the perspective of students' self-evaluation, it is confirmed that the introduction of these two media plays a role in students' mastery of listening content. This result is consistent with the law revealed by the accuracy curve of classroom practice

Conclusion

Video assisted instruction, in lesson preparation and courseware making, should present some typical to trigger students' thinking, so as to reduce students' burden and better serve teaching through modern machines. This research paper is based on understanding the use of virtual reality technology and intellectual property of innovative strategies in the teaching process. The use of innovative strategies holds a significant place in the present era because of technological advancement. In every field of the world, technology plays a pivotal role. The progress and development of all the modern fields are because of technology. Also when any field progresses due to the innovation strategies and technology it results in the overall development and progress of the world. In the

education field, the use of virtual reality is a blessing as it provides the students with a unique and memorable experience. Students cannot experience this unique experience without innovation and virtual technology. By using virtual reality technology teachers can form fictional objects and then can teach about them very efficiently. The mystery of the known problems can also be solved using virtual reality. In the present world students who are learning with the help of innovation and virtual reality are more indulged in studies than those who learn by traditional methods. The motivation and morale of students increases when they learn with the help of innovative strategies. Virtual reality has several advantages. The first advantage of using virtual reality is that it is safe as well as handy. The second advantage of virtual reality is that it has increased the possibility of learning. It has one disadvantage that it makes the students obsessed with it and this technology is a little bit more expensive than others. Various methods and models have been discussed in the research article that explains the importance and working of virtual reality technology. The first model explains the construction of multimedia video recording assisting teaching methods by using innovation strategies. The second model explains the evaluation algorithm of multimedia video recording that assists in the teaching process. The third model explains the implementation process of a multimedia video recording program. All these models thoroughly explain the concept and need for a multimedia video recording system in assisting the teaching methodology with innovation. In short, through "video assisted teaching", in addition to improving the quality of teaching, increase students' love and cultivate students' habits. We should reasonably quote "video assisted instruction" in teaching to give full play to its practicability and popularization.

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