The Application of MIR Technology in Higher Vocational English Teaching

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***Abstract*—The traditional teaching model is teacher centered, with conservative textbooks and methods. To some extent, multimedia information retrieval technology can provide relevant information based on user query conditions, thereby alleviating the problem of information overload. This study applies image retrieval, audio and video retrieval techniques from multimedia information retrieval technology to vocational English education. It is recommended to include visual, auditory, and video materials in the course plan to meet the needs of all students. This will help ensure that the teaching objectives of each unit are achieved. Multimedia information retrieval technology may create a new learning mode in which vocational college students can use a series of mobile terminals for learning activities at anytime and anywhere, making learning more comfortable and personalized. A random double-blind survey questionnaire was designed to investigate student satisfaction and evaluate the effectiveness of multimedia information retrieval technology in vocational English teaching, in order to test the effectiveness of multimedia information retrieval technology in vocational college English teaching. According to the survey results, the majority of students acknowledge the performance of multimedia information retrieval technology in English teaching. Therefore, the application of multimedia information retrieval technology in vocational English teaching is conducive to cultivating students' self-learning ability and creative thinking ability. Meanwhile, multimedia information retrieval technology has improved the quality and level of information literacy education for college students.**

Keywords*—English teaching in higher vocational colleges; multimedia information retrieval technology; applied research; modern teaching models

I. Introduction

With the continued development of higher vocational education, the country has set greater standards and expectations for English teaching reform. The basic requirements of English teaching emphasize that the talents cultivated by higher vocational education are applied professionals in technology and production [1], [2]. Higher vocational English courses aim to develop students' language skills, particularly students' capacity to utilize English to deal with every day and international business activities, in addition to helping students build a strong linguistic foundation. Therefore, the ultimate goal of English learning is to cultivate learners' comprehensive English application abilities, especially their listening and speaking abilities, and to cultivate language learning as a skill [3], [4].

In recent years, higher vocational education colleges have been constantly reforming and exploring English teaching, developing new curriculum standards and new teaching methods [5]. By integrating multimedia information retrieval (MIR) technology into English teaching, higher vocational education colleges have enhanced the teaching process and improved the effectiveness of instruction. Teachers use MIR technology to instruct English in the teaching technique. In an English lesson, the learning approach centered on grammar and reading is replaced with that based on listening and speaking [6], [7]. The teaching mode has shifted from the traditional classroom with teachers as the main body to individualized and independent learning. The classroom evaluation method has changed from the original evaluation based on grammar learning and reading to the formative evaluation based on listening and speaking ability [8].

MIR technology refers to the methods, strategies, and means of using modern information retrieval systems to retrieve relevant information. The most widely used modern information retrieval systems include online and network databases [9]. MIR technology can provide relevant information based on the user's query conditions, thereby alleviating the problem of information overload to some extent. An interesting study is applying MIR technology to English education in higher vocational colleges (HVCs). In information technology, information retrieval technology plays an important part in the transformation of the English teaching style in higher vocational colleges [10].

Colleges use network information in higher vocational and technical education to drive educational modernization. The function of MIR technology in educational development mainly includes the following aspects [11]. For students, MIR technology can produce a new way of learning, allowing students to use a variety of mobile terminals for learning activities, making learning more convenient and personalized. For colleges, MIR technology can change the mode of educational resource allocation. The relationship between users and resources is one-to-one correspondence in traditional educational resources. Still, the relationship between users and resources is transformed into a non-contact one-to-many relationship in the modern information technology environment. Using the Internet, students can share any teaching resource library to realize the fair allocation of educational information resources and promote the dynamic development and utilization of educational resources [12].

In the Internet environment, resource users are constantly adding new resources. Resources' content and expression form are constantly enriched, realizing the dynamic development of network resources. The resource user has changed from a single-user role to a dual role of user and builder. Therefore,

knowledge is updated more rapidly, and many new theories and knowledge that have not appeared in textbooks can be understood through the Internet. MIR technology can improve teachers' teaching and research abilities [13]. Through the Internet, teachers can watch and observe classes, master the latest teaching materials, interact with other teachers or education experts for discussion and exchange, and improve their teaching level. As for the college teaching mode, MIR technology promotes the innovation of the teaching mode. At present, the high-quality courses provided on the Internet can enable students to learn their favorite courses anytime and anywhere and master the learning progress. Still, there is a lack of interaction and communication. Based on MIR technology, the network teaching mode combines the benefits of these two modes to create a new teaching mode [14]. Because colleges use MIR technology to supplement traditional instruction, the role of instructors has shifted. Teachers can improve students' information retrieval level through MIR instruction to improve student's learning ability, which is conducive to improving the quality and degree of students' information literacy education [15], [16].

Traditional English teaching only attaches importance to the mechanical input and accumulation of English knowledge. Still, it ignores the inspiration of students' English learning process, especially the English language practice and other processes. Students learn passively, the classroom environment lacks vibrancy, and there is no emotional communication between teachers and students. Teachers must not only transfer knowledge and skills effectively and flexibly in organizing classroom teaching, as aided by MIR technologies. Simultaneously, teachers should engage the classroom environment, alter students' motivation to learn, and encourage emotional dialogue between teachers and students. Emotional classroom management between teachers and pupils is critical [17]. To regulate students' emotions and stimulate students' interest in learning English, teachers should reflect the teaching consciousness of democracy and equality in every link of English classroom teaching. English teaching is not simply the accumulation of words and grammar knowledge but the wisdom of allowing students to acquire knowledge and ability. In organizing teaching, teachers should release their inner passion according to students' psychology so they can independently and creatively find and analyze problems.

The evolution of MIR technology has been closely linked to the advancement of computers, databases, and networks. The potential for MIR technology in English instruction at HVCs is looking promising. Mastering MIR technology not only develops students' ability to obtain, filter, and thoroughly analyze information resources, but it also improves college students' creativity [18]. Teachers should focus on developing students' capacity to use knowledge, interact with information, and study problems independently, which can boost students' excitement for learning and improve their inventive thinking [19].

This research applies image retrieval, audio, and video retrieval technology in MIR technology to higher vocational English education to address the challenges indicated above in the traditional English teaching model. It is proposed to incorporate image, audio, and video retrieval content into the teaching objectives and develop unit teaching objectives that satisfy the needs of all students in the specific teaching process. MIR technology can create a new learning style for higher vocational students. MIR technology in colleges can potentially alter the paradigm of educational resource allocation. To evaluate the efficiency of MIR technology in higher education's English instruction. A questionnaire survey is created based on the randomized, double-blind approach to analyze the efficacy of MIR technology in higher vocational English instruction. The trial outcomes demonstrated the value of MIR technology for teaching English and motivating students in the classroom.

The research is divided into five sections. Section I elaborate and analyze the background of the application of audio and video retrieval technology in vocational English education. Section II discusses the multi-level retrieval model of English digital teaching information and the intelligent system structure of English digital teaching. Section III elaborates on modeling methods and the combination of MIR technology and education is the trend of teaching reform and development in vocational colleges. Teaching based on MIR technology is crucial for improving the quality of university teachers and changing professional teaching content. Section IV designed a questionnaire based on the random double-blind principle and surveyed student satisfaction to evaluate the effectiveness of multimedia information retrieval technology in English teaching and also delves into discussion. Section V summarizes the entire text. The research results indicate that students generally believe that traditional English teaching methods cannot meet the needs of modern talent cultivation. The above data indirectly indicates the gradual decline of traditional teaching methods and the necessity of integrating new technologies into English classroom teaching.

II. Related Works

Cheng and Liu [20] examined the use of multimedia technology to help educators remove the barriers that prevent them from achieving their educational goals and producing graduates who meet society's requirements. They concentrate on how multimedia networks can effectively help business English majors in higher education institutions expand their job experience and strengthen their practical English abilities, as well as computer skills, communication skills, and overall cooperation skills. Zhang [21] discussed the effects of translation curriculum reform and the introduction of multimedia information retrieval technology on translation teaching. Translation teachers demand MIR technology teaching methods in language translation teaching. Liu [22] proposed a clustering method for hybrid ELT resources based on information retrieval. First, he analyzes the structural features of hybrid ELT resources and constructs a multidimensional feature distribution constraint of hybrid ELT resources by using a segmented linear fusion retrieval method. Secondly, based on the results of beam domain calculation for retrieving hybrid English teaching resources, he constructs a distribution structure model of hybrid English teaching resources. He completes the retrieval of English teaching resources. Finally, the distance between samples and each cluster prime in the set of English hybrid teaching resources is the distance within clusters, and the clustering objective

function completes the clustering of English hybrid teaching resources. A literature review of pedagogical approaches to teaching information retrieval was conducted by Fernández et al. [23] Jiang and Sun [24] created a hierarchical retrieval model for English digital teaching information and an intelligent system structure for English digital teaching. Furthermore, they used a non-negative matrix factorization approach to judge the structural similarity of English teaching material and built a hierarchical retrieval model, which increased teaching efficiency even further.

Through reviewing and analyzing existing literature, we found that although some achievements have been made in the research of blended English education resources, there are still some gaps and issues that need further exploration. Firstly, regarding the distribution structure of blended English education resources, existing research mainly focuses on the design and development of resources, while there is relatively little research on the distribution structure and models of resources. In addition, existing research lacks a comprehensive comparison and analysis of different types of educational resources, as well as in-depth research on the dynamic changes and influencing factors of the distribution structure of educational resources. Therefore, this study aims to fill this gap by conducting empirical research to explore the distribution structure model of blended English education resources, and analyzing its influencing factors and dynamic changes.

III. Modeling Methods

A. MIR technology

The research of multimedia information retrieval emerged at the end of the last century and has gradually become a new important research area in information technology. MIR aims to effectively describe, organize, and find users' required multimedia information. The research of MIR involves computer vision, signal processing, pattern recognition, and many other disciplines, which have important theoretical significance [25], [26]. At the same time, MIR technology is a study area that closely integrates theory and practice. The ultimate goal is to solve information inflation and make it easier and more accurate for individuals to access the required multimedia resources [27].

Fig. 1 shows the general flow of a typical MIR system. Firstly, the system processes and analyzes the multimedia information in the database and builds the corresponding content representation and index. A canonical content query representation is generated when the user submits a retrieval requirement. Finally, the similarity is calculated according to the matching model, and the retrieval result set is returned [28], [29].

Image retrieval, audio retrieval, and video retrieval technologies are applied to English teaching in higher vocational colleges. The classification of MIR technology is shown in Fig. 2. The following describes the theories and related knowledge of the three technologies adopted in this paper.

The foundation of content-based picture retrieval is automatic feature extraction. In a broad sense, image features comprise high-level semantic information and low-level visual elements. However, existing computer vision and image comprehension technology cannot automatically extract semantic characteristics from images. Because neither picture object extraction nor recognition technology has achieved an optimal state, the most often employed low-level visual features remain low-level. The color feature is less dependent on the image's size and direction and has good compactness [30], [31].

The color histogram is the most widely used among all the color features. The color histogram is the statistics of the color values of all pixels in an image, which is defined as follows:

$$h(i) = \frac{n_i}{N}, i = 0,1, \dots, K \quad (1)$$

where, n is the number of pixels whose color value is i in the image, n is the total number of pixels, and K is the range of possible color values. The resulting color histogram is a k-dimensional eigenvector. The spatial location of each color is unimportant to color histograms, which instead describe the proportion of various colors in the entire image. Therefore, they are especially suitable for describing the image content that does not need to consider the spatial location of specific objects.

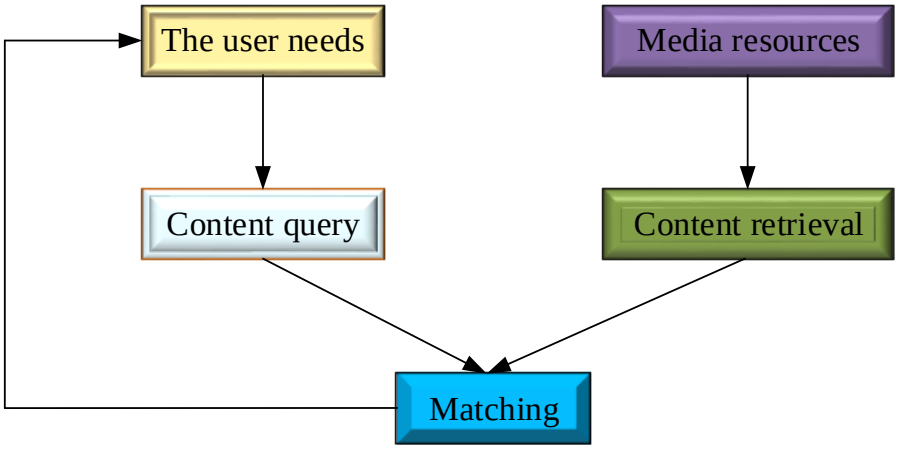

Fig. 1. Flow chart of multimedia information retrieval.

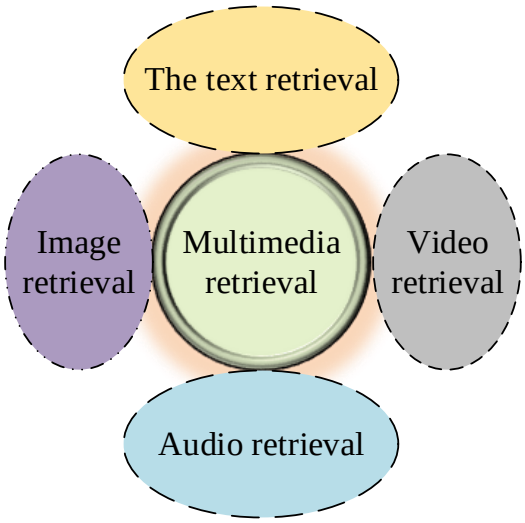

Fig. 2. Classification of MIR techniques.

In many applications, the color image is transformed from RGB space to HSI space for retrieval [32]. The conversion formula from RGB to HSI is:

$$h = \begin{cases} cos^{-1}\frac{(r-g)+(r-b)}{2\sqrt{(r-g)^2+(r-b)(g-b)}} & b \le g \\ 2\pi - cos^{-1}\frac{(r-g)+(r-b)}{2\sqrt{(r-g)^2+(r-b)(g-b)}} & b > g \end{cases} \quad (2)$$

$$s = max(r,g,b) - min(r,g,b) \quad (3)$$

$$i = \frac{r+g+b}{3} \quad (4)$$

where, r, g, and b respectively represent the picture's pixel values of red, green, and blue.

Another very simple and effective color feature is the color moment. Unlike histograms, color moments can express certain color distribution information [33]. Let p_{ij} be the i-th color component of the j-th pixel in the image, then the calculation on this color component is as follows:

$$u_i = \frac{1}{N}\sum_{j=1}^{N} p_{ij} \quad (5)$$

$$\sigma_i = (\frac{1}{N}\sum_{j=1}^{N}(p_{ij} - u_i)^2)^{\frac{1}{2}} \quad (6)$$

$$s_i = (\frac{1}{N}\sum_{j=1}^{N}(p_{ij} - u_i)^3)^{\frac{1}{3}} \quad (7)$$

Audio retrieval is a relatively new research field. Speech recognition is recognizing basic elements such as words and phrases in speech signals and then analyzing these language symbols to extract their implicit semantics. Audio retrieval is the processing, analyzing, and comprehending all audio signals, including speech and non-speech signals, to achieve the content retrieval required by users. Speech recognition technology can be applied to audio retrieval to meet speech-related retrieval needs [34].

Volume is the most widely used and easily calculated frame feature. The volume feature can be directly used for mute detection and audio segmentation. Volume is defined as follows:

$$v = \sqrt{\frac{1}{N}\sum_{i=0}^{N-1} s_i^2} \quad (8)$$

where, N is the total number of sampling points in the frame and s_i is the value of each sampling point.

In general, voiceless signals have low energy and a high zero crossing rate. Therefore, by integrating zero-crossing rate and volume features, a part of voiceless speech can be prevented with low energy from being wrongly classified as silent, which is defined as follows:

$$z = \frac{1}{2}\sum_{i=1}^{N-1} |sign(s_i) - sign(s_{i-1})| \quad (9)$$

For the signal sequence $\{s_i\}$ obtained after sampling, people always want to use a model to simulate its generation. If the audio sequence $\{s_i\}$ is approximated by a linear model with finite parameters, these parameters can become important features to describe the sequence, called linear predictive coefficients. Under this linear prediction model, the prediction of the next sample can represent the weighted sum of the previous samples:

$$\hat{s}_n = \sum_{i=1}^{p} a_i s_{n-1} \quad (10)$$

where, $\{s_i\}$ is the linear prediction coefficient. In practice, it mainly establishes an optimal prediction model for the in-frame sampling sequence. Generally, the method of least mean square error is adopted. The in-frame prediction error is:

$$e = \sum_k (s_k - \sum_{i=1}^{p} a_i\, s_{k-1})^2 \quad (11)$$

The prediction error is set as the minimum value, and P parameters $\{s_i\}$ of the best prediction model are obtained, which are used as the linear prediction coefficient features of the current frame.

Video contains a large amount of information and rich connotation, including not only all the information of the still image but also the information of the target's movement in the scene and the information of the objective world changing with time. With the development of computer hardware and video processing software, video information has expanded rapidly. In the face of rapidly expanding video data, locating the necessary information becomes an urgent problem. To solve this problem, content-based video retrieval has been developed since the 1990s [35]. The core is to process and analyze video content to effectively obtain its content and make it easy to search and interact with data.

To obtain the global motion information, estimating the camera motion in the video is necessary. A video sequence is composed of a series of time-related image frames, and the difference between these image frames corresponds to the motion information in the video. Extracting global motion information is basically to find and determine the spatial position of each point in the background on different frames. Let $\{a_i\}$ be a set of parameters of global motion, (x, y) be a point on the current frame, and (u, v) be its corresponding point on the next frame; then the general global model can be expressed as follows:

$$\begin{cases} u = f_u(x, y, a_1, a_2, \dots) \\ v = f_v(x, y, a_1, a_2, \dots) \end{cases} \quad (12)$$

Images, video, and audio are the main components of multimedia information. Considering the richness of information in the various multimedia media, information is missing if only a single medium is used. Therefore, this paper integrates multiple MIR technology modules into higher vocational college English teaching.

B. *Application of MIR technology in higher vocational English*

With the development of information technology, more and more college teachers are incorporating Internet resources into their daily teaching. The rich and colorful online information brings infinite resources to teaching and provides great teaching convenience. Resources such as pictures, audio, and videos related to the course can be used as materials for teaching. Teachers can make full use of Internet teaching tools. Such classes have the potential to increase teaching efficiency and quality significantly. As a result, it is critical for teachers to understand the fundamentals of MIR technology and to be able to access relevant information on the Internet swiftly. The combination of MIR technology and education is a trend in teaching reform and development in higher vocational institutions. Teaching based on MIR technology is critical for increasing the quality of college teachers and altering professional teaching content.

MIR is an effective way to cultivate students' autonomous learning in the English teaching of HVCs. Teachers can use pictures, audio, and video retrieval in MIR technology to promote knowledge updating, improve self-learning ability, and cultivate students' innovative spirit. Therefore, MIR effectively solves information overload, self-learning, and knowledge update problems. In practical teaching, teachers' goal design often generally describes the goal, lacking standards and levels. It only focuses on the knowledge and ability goals, ignoring students' ideological basis. Therefore, when MIR technology is used to assist English teaching, it is better to focus on the target design to conform to the content of pictures, audio, and video retrieval. The picture, audio, and video retrieval content should be integrated into the teaching objectives in the course content and teaching method. At the same time, image retrieval, audio, and video retrieval technology should be selected around the five aspects of skills, knowledge, emotion, strategy, and cultural awareness. Fig. 3 shows the curriculum content structure and teaching methods teachers formulate.

As the beacon guiding the implementation of teaching, the method of MIR should be formulated based on the pupils' actual condition. At the same time, when students use multimedia information retrieval, teachers should examine and reflect on the appropriateness of pictures, audio, and video retrieval through teaching feedback and teaching practice results. Teachers should combine teaching materials, curriculum standards, and teaching objects in English. At the same time, English teachers should take the curriculum standard as the key link, understand the essence of the textbook, and organize the textbook systematically. English teachers who work with the teaching materials can suitably modify and arrange the instructional material to satisfy various educational objectives and needs. Many English teachers in actual classroom settings are unaware of each student's unique characteristics. The polarization of pupils is caused by the fact that teaching objectives are frequently appropriate for some students but not all. Every student is unique, and English teachers should be aware of this. They should also understand the students' current circumstances and knowledge bases. At the same time, due to the student's actual level, English teachers retrieve appropriate pictures, audio, and video information and formulate unit teaching objectives to meet the needs of all students. Secondly, English teachers should pay attention to improving the effectiveness of English classroom teaching in vocational education, which requires clear objectives for classroom teaching activities. Therefore, it is possible to get the logical relationship that should be considered when setting curriculum standards, teaching objects, and textbooks, as shown in Fig. 4.

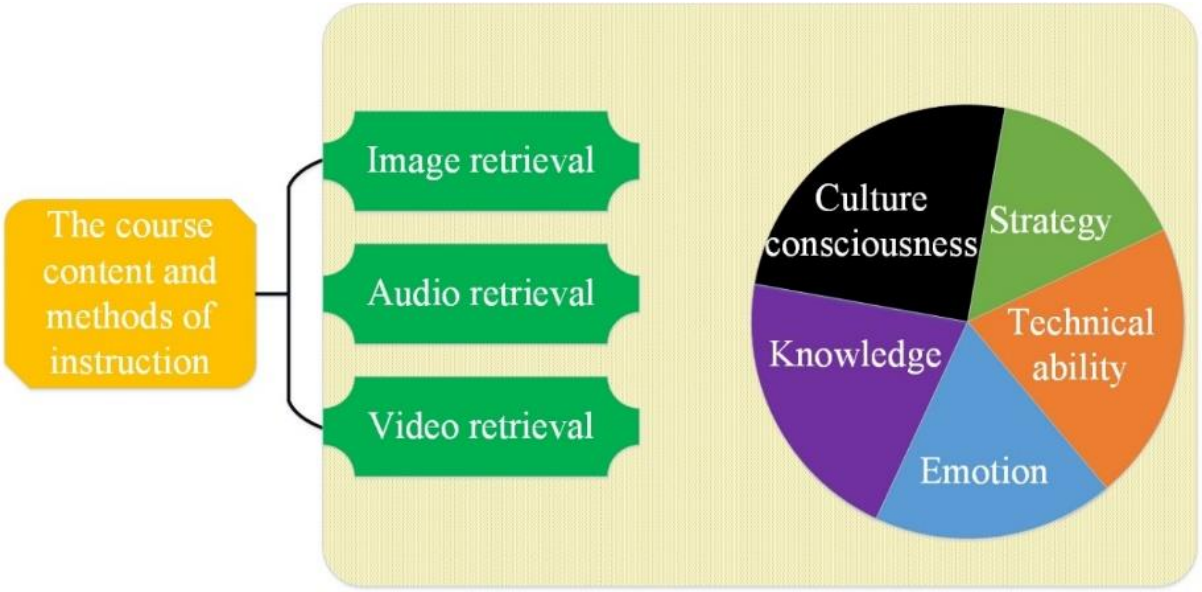

Fig. 3. Course content and teaching method structure.

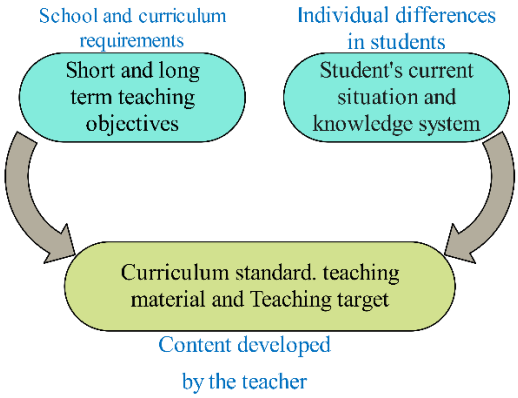

Fig. 4. Teachers set curriculum standards, teaching objects, and the logical relationship between teaching materials.

IV. Discussion and Analysis of Results

This experiment designed a questionnaire based on the principle of random double-blind and investigated students' satisfaction to evaluate the effectiveness of multimedia information retrieval technology in English teaching [36], [37]. In the questionnaire survey, the setting of the satisfaction question is shown in Fig. 5. The satisfaction settings are divided into five options, which represent "very dissatisfied," "dissatisfied," "unsure," "satisfied" and "very satisfied."

To ensure the professionalism and fairness of the survey objects, the data of this experiment were collected from teachers with rich experience in MIR technology and English teaching in HVCs as the questionnaire objects. Considering the differences in the teaching experience of different teachers, 50 students were asked to rate the classroom effect of the two teachers, respectively, and 100 student questionnaires were collected at the end. Fig. 6 shows the teaching satisfaction evaluation of integrating MIR technology and English teaching. It can be seen that 80% are very satisfied, 10% are satisfied, 5% are uncertain, 5% are dissatisfied, and the number of very dissatisfied is 0. The results show that students agree with the teaching model of integrating MIR technology with English teaching, and students generally believe that English teaching under the new model will achieve better results. Classroom instruction combined with MIR provides students with many learning opportunities. Multimedia modes of expression also boost students' interest in learning by making the educational content more vivid and fascinating. Multimedia has a significant advantage in presenting real educational content while breaking down crucial and challenging themes.

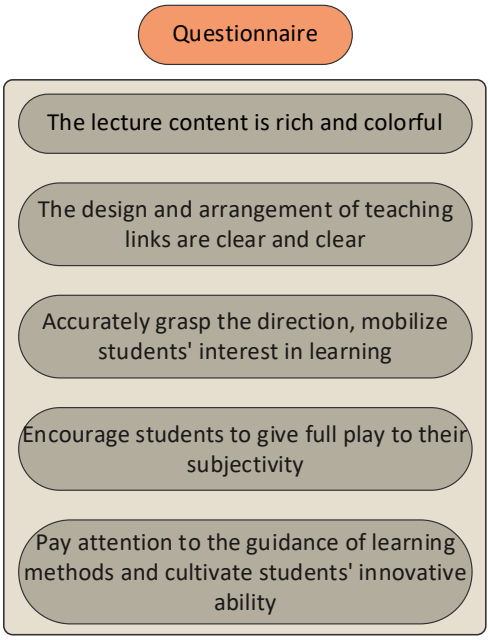

Fig. 5. Specific questions of the questionnaire.

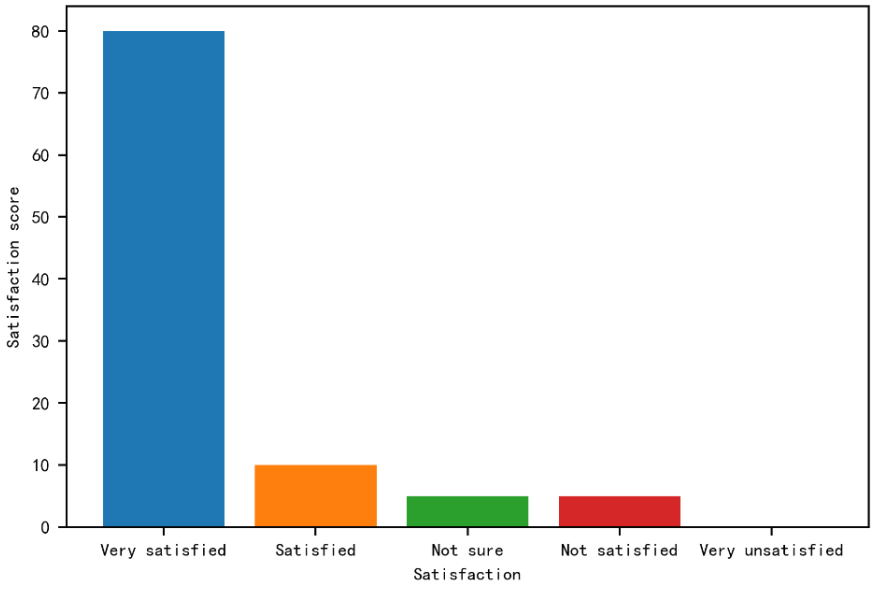

Fig. 6. Teaching satisfaction evaluation of the integration of MIR technology and English teaching.

Similarly, teachers with rich experience in traditional English teaching in HVCs are collected as subjects to participate in the study. Considering the differences in the teaching experience of different teachers, 50 students were asked to rate the classroom effects of the two teachers, respectively, and 100 student questionnaires were collected in the end. Fig. 7 shows the teaching satisfaction evaluation of the traditional English teaching model. It can be seen that 10% are very satisfied, 20% are satisfied, 5% are unsure, 50% are dissatisfied, and 15% are very dissatisfied. The data results show that students have low recognition of the traditional English teaching model, and students generally believe that the traditional English teaching model cannot meet the needs of modern talent training. The above data indirectly indicate the gradual decline of traditional teaching methods and the necessity of integrating new technologies into English classroom teaching.

To ensure the credibility of the experimental results, the overall evaluation scores of the classroom effects for five students are randomly selected from the questionnaire. Furthermore, Fig. 8 compares the evaluation scores of English teachings driven by MIR technology and traditional teaching. The experimental results show that the evaluation scores of English teachings driven by multimedia technology are generally higher and more popular with students. Traditional English teaching generally has low scores and is unpopular with students. To sum up, English teaching classrooms driven by MIR technology are more popular among students than traditional English classrooms, which is the future trend of higher vocational teaching.

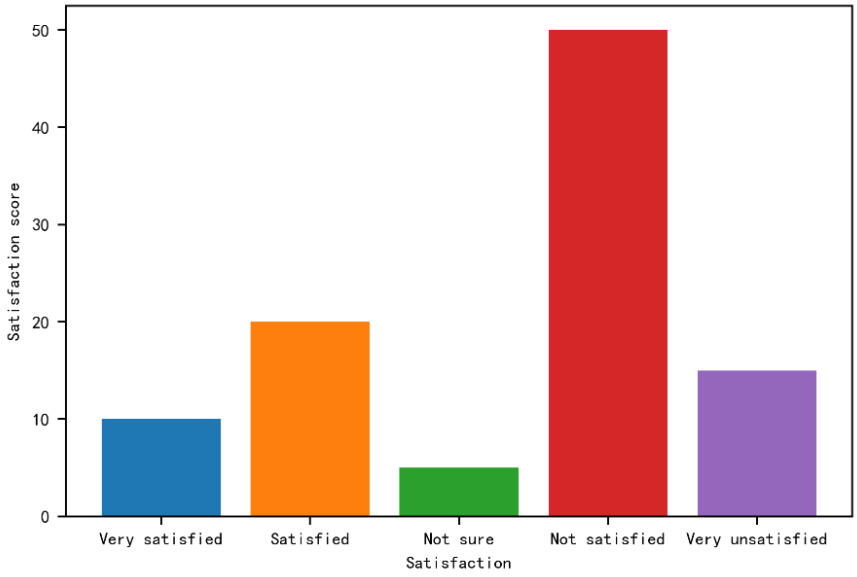

Fig. 7. Traditional English teaching mode of teaching satisfaction evaluation.

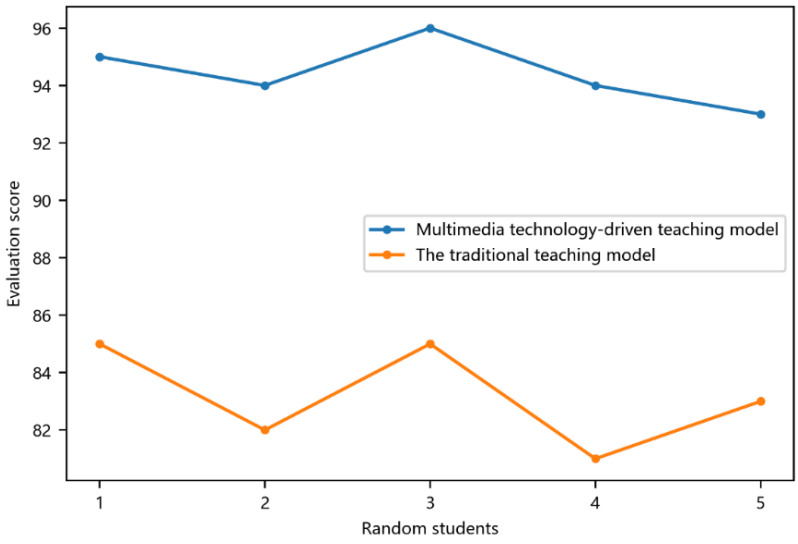

Fig. 8. Comparison of evaluation scores between multimedia-driven and traditional teaching models.

MIR technology has substantially enlarged the time and space restrictions of education and educational content resources. It has unprecedentedly expanded educational methods and means, altered traditional teaching modes, and ultimately led to a major reform of educational philosophy, educational concept theory, and even the entire educational system. As a result, it is vital to face the challenges of modern educational technology with courage, seize good development prospects, and improve MIR technology in higher vocational English teaching.

V. CONCLUSIONS

Mastering MIR is a shortcut to accessing and utilizing new knowledge. By mastering MIR technology and obtaining information, English teachers in higher vocational colleges can make further effective use of information, accelerating teachers' improvement of the quality of teaching. In this paper, the image retrieval technology, audio retrieval technology, and video retrieval technology of MIR technology are applied to English teaching in HVCs, and the teaching objectives of units are formulated to meet the needs of all students. To test the effectiveness of MIR technology in higher vocational English teaching, a questionnaire is designed based on random double-blindness to investigate student satisfaction and evaluate the effectiveness of MIR technology in higher vocational English teaching. The experimental results show that 80% of the students agree with the performance of MIR technology in English teaching. 65% of the students are unsatisfied with the traditional English teaching model. Therefore, MIR technology can produce a new learning method to make learning more convenient and life-enhancing.

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COMPETING OF INTERESTS

The authors declare no competing of interests.

AUTHORSHIP CONTRIBUTION STATEMENT

Xiaoting Deng: Writing-Original draft preparation, Conceptualization, Supervision,

AVAILABILITY OF DATA AND MATERIALS

On Request

DECLARATIONS

Not applicable.

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