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Application of Artificial Intelligence in the Curriculum Design of Wushu MOOC Teaching in Colleges and Universities

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Abstract With the development of educational informatization, the development of open education movement, and the continuous development and maturity of big data, artificial intelligence and other technologies, MOOC teaching has become an important part of educational informatization and an important means to improve the quality of education. Expanding and deepening educational reform, equality in education, equality in individual learning, and equality in ethnic Wushu education are important areas for the training of future Wushu teachers. The rationality of curriculum design is crucial to students' knowledge acquisition. The 21st century is the century of the Internet. The combination of martial arts courses and open online courses allows students to learn in their spare time. Online MOOC learning is gradually globalized, and educational resources are allocated according to their scale, openness, networking, personalization, and interactivity. Therefore, this paper optimized the curriculum design of Wushu MOOCs through AI technology, so as to promote the effect of Wushu teaching. The results showed that the teaching effect and students' initiative of Wushu MOOC under AI were higher than those of traditional Wushu courses, and the teaching effect was about 7% higher, and the students' initiative was 9% higher.

Index Terms Martial Arts Teaching, Artificial Intelligence, MOOC Teaching, Course Design

I. Introduction

The emergence of AI technology not only provides a platform and technical foundation for networking, but also promotes innovation in educational reform. In the new media age, all teacher training is conducted online through the media. Therefore, the correct and effective use of different information technologies is crucial to the quality of classroom teaching. The introduction of effective martial arts teaching methods in colleges and universities can effectively promote the application of MOOCs in colleges and universities, promote the informatization of martial arts teaching, realize students' autonomous learning, cultivate students' interest in learning martial arts, and enhance traditional martial arts culture.

As a traditional sports event, Wushu has more and more diversified teaching methods. Wang B believed that Wushu has been spread in the name of sports for a long time, which limited the development of Wushu culture [1]. Deng L introduced three-dimensional imaging technology on the basis of traditional physical education teaching methods, aiming to explore a new martial arts teaching mode through image reconstruction and posture analysis [2]. Ju Y believed that Wushu translation plays an important role in teaching Chinese Wushu and helping people of different nationalities understand and learn Chinese culture [3]. Chen S achieved the goal of student-centered sports analysis by designing circuit boards on field programmable gate arrays, taking students' emotions as the main line [4]. Zhang N analyzed the feasibility of expanding training in martial arts teaching in colleges and universities by analyzing the application of expanding training in martial arts teaching in colleges and universities, and expounded the mode of expanding training applied in martial arts teaching in colleges [5]. Chen P conducted a research on the current situation of Wushu teaching in a school to provide reference and theoretical basis for the development of Wushu [6]. Duan L analyzed the differences between physical education content and teaching objectives in school Wushu education, and discussed the rationality of how Wushu education should return to traditional inheritance education from the aspects of teaching content and teaching objectives [7]. The above studies all describe the online teaching methods of Wushu, but AI technology is not used in teaching.

As a new technology, AI has more and more applications. Maduabuchi C proposed the first AI optimization via deep neural network to improve its power generation rate and efficiency while guaranteeing a long service life [8]. M Lidia Alcala established a new diagnostic approach based on multiparameter and targeted biopsy [9]. Na J Y compared the performance of AI analysis with conventional analysis to identify symptomatic risk factors in very low birth weight infants [10]. Bukret W E was evaluating predictive risk factors for complications and validating a new risk assessment model using AI and a machine learning process with support vector machines to validate risk

scores [11]. Sausen A proposed a method to determine the medium and then to calculate the electricity consumption data measured by the city's energy utilities [12]. Jones O T was systematically reviewing AI techniques that aid in the early diagnosis of cancer and can be applied to primary care electronic health record data [13]. Visaggi P believed that blood biomarkers provide an inexpensive and non-invasive screening strategy for cancer, and then used AI technology to identify candidate markers [14]. The above studies have described the functional role of AI, but they have not been applied to martial arts teaching.

With the support of AI technology, all the technical movements in Wushu are analyzed through the design of the MOOC course of Wushu movement decomposition. By analyzing the difficult movements of martial arts, all the little knowledge points and precautions are added to deepen the students' perception. By dividing knowledge points into modules, the learning resources of MOOCs also take up less storage space. Since each MOOC's chapter video contains only one action, the video training time is relatively short. Students can learn other action videos in MOOCs in their spare time. Teachers can also introduce and explain these teaching videos, and deepen students' understanding of martial arts technical movements through action demonstrations, thereby improving the quality of teaching.

II. Positioning and Mode of MOOC Courses

(1) Basic positioning of MOOCs

As a large-scale online course, MOOC is different from the traditional online course, which is a copy of the traditional process and then distributed in online video courses. The MOOC is a comprehensive, planned and structured course, which decomposes all the knowledge of the course into small knowledge, and then transmits short video by a professional group, equipped with excellent teachers, and provides high-quality teaching materials for students. Almost all MOOCs include modules and learning communities, such as course introduction, course design, assessment rules, instructional videos, and practical courses, which make up the overall course organization structure [15].

(2) The curriculum model of MOOCs

As shown in Figure 1, it is generally believed that the two main learning modes of MOOCs are the cMOOCs mode based on relativity theory and the XMOOCS mode based on behavioral learning theory. In the cMOOCs model, teaching is done by teachers themselves, mainly distributed cross-platform. The course content is not structured, but is determined by the participants of the symposium [16]. Tools are used to integrate learning resources, and information is sent daily, but timely feedback is lacking. Teaching evaluation is mainly realized through resource integration or mutual evaluation of students. The grading scale is the student's ability to successfully complete independent learning without a teacher. The xMOOCs model is supported by a strong learning team, and the courses are customized on the same platform. Course content is mainly videos and lectures, and a wide range of subject learning support platforms and services provide learners with learning support services, and can also receive timely feedback on learning outcomes. Teacher evaluation is mainly completed through the comprehensive evaluation of teachers' daily work, participation and test scores through mutual evaluation of students; the evaluation standard is whether teachers have the ability to promote students' good learning.

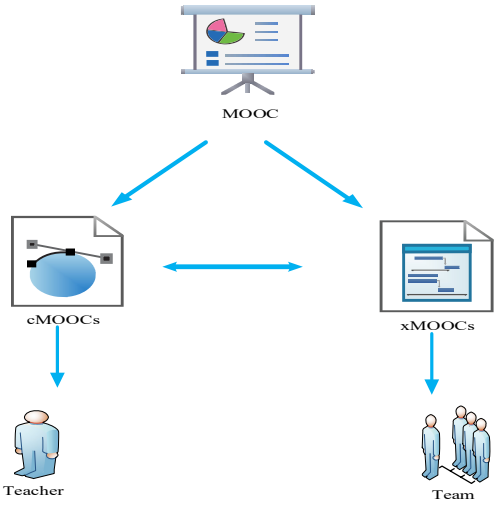

Figure 1: MOOC's course mode

(3) Challenges facing the development of MOOCs

At present, there are four problems in the development of MOOCs, as shown in Figure 2. First of all, the completion rate of study and research is low, the success rate of students in MOOC assessment is less than 10%, the learning viscosity of students is low, and the number of registrations is large, but most students do not take it seriously. Secondly, there are obvious traces of traditional classrooms, but many teachers lack a comprehensive understanding of the uniqueness and innovation of classrooms, lack of original teaching methods and content, lack of interaction with students, and have obvious traces of traditional classrooms [17]. Third, the curriculum learning is single, and the social students' academic performance lacks effective resources, which cannot be converted into educational achievements recognized by most schools. In addition, MOOCs also have higher requirements on the quality of education, and non-formal education has not established a mechanism to meet the social needs of students, and to exchange and transfer credits flexibly. Fourth, the quality of MOOC education varies. Currently, in many courses, the necessary components of MOOCs are missing, and students cannot learn comprehensively and systematically.

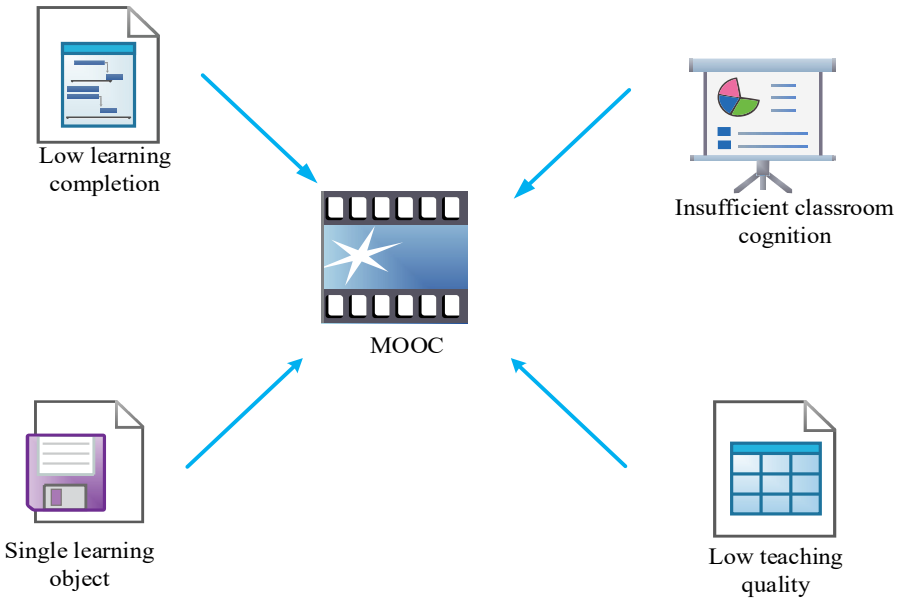

Figure 2: Challenges faced by MOOC development

III. Development and Design of Wushu MOOC Courses under AI

(1) Application of AI in Wushu teaching

a) Application of multimedia technology in Wushu teaching

Multimedia computer technology is the product of the combination of multimedia and AI. It is a technology that can simultaneously receive, process, edit, store and display two or more different types of information. The main goal is to provide students with an authentic martial arts experience session that encourages students to directly control the learning environment. The rational use of multimedia computer-aided teaching can allow students to maintain their nervous systems under various stimuli, master sports knowledge and techniques, impart skills in a relaxed and dynamic atmosphere, and overcome the fatigue that may occur in traditional teaching. The use of AI not only expands students' horizons and develops intelligence, but also promotes the comprehensive development of individuals. Computer-aided multimedia teaching has great advantages in martial arts teaching, reflecting the new trend of sports technology and education development.

b) Application of virtual technology in Wushu teaching

Virtual technology combines the latest developments in various fields of information technology, providing strong support for creating and mastering virtual worlds. Using the characteristics of virtual reality in the AI system, an "expert simulation system" was constructed [18]. With the help of the three-dimensional space representation of virtual reality, a human motion model is established. Virtual reality can not only simulate the real world, but also go beyond the real world, improving participants' perception of the real environment and deepening their understanding of educational content. The application of AI in teaching practice not only improves the level of training, but also promotes the development of training.

(2) The principles of Wushu MOOC curriculum design

There are five main principles of Wushu MOOC curriculum design, as shown in Figure 3.

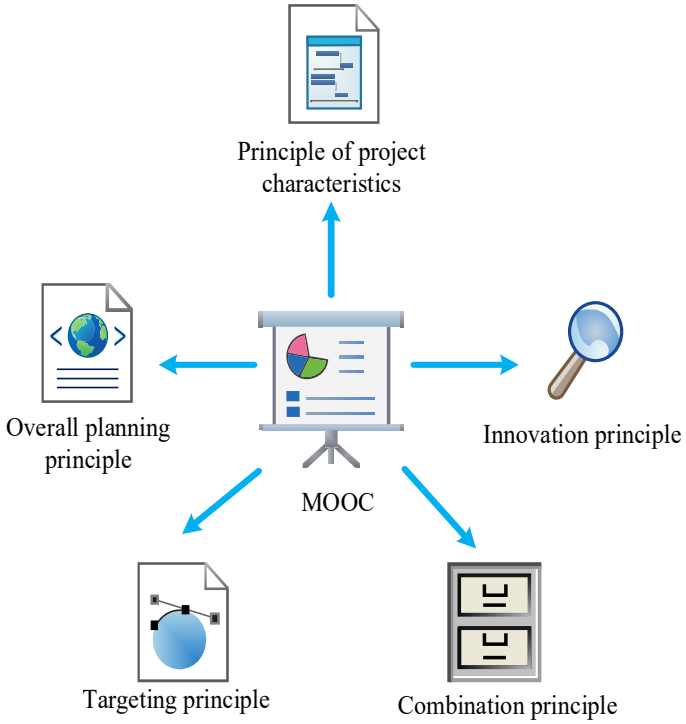

Figure 3: Principles of Wushu MOOC course design

a) The design principle is based on the characteristics of martial arts projects

The design of Wushu MOOC should fully reflect the characteristics of Wushu and be oriented by students' learning goals. According to the actual content of martial arts teaching, the student-centered teaching process is insisted, and a martial arts teaching syllabus that suits the needs of students is designed, so as to train martial arts teachers and students of traditional national sports in martial arts skills.

b) The principle of innovation and fun

When carrying out martial arts courses, it is necessary to innovate and interesting teaching methods, and fully consider the motivational effect of participating in martial arts courses. Martial arts courses are designed to develop students' ability to identify, analyze and solve problems, develop unique learning models, and stimulate students' creativity and intellectual curiosity. Therefore, the design of Wushu MOOC must focus on the organic combination of innovation and quality [19].

c) The principle of combining with actual teaching activities

On the basis of analyzing the current situation of traditional martial arts training and national sports, it is proposed to establish a martial arts MOOC course, and determine the core of improving students' learning efficiency. If the MOOC is developed on the basis of practical teaching activities, but cannot be used for practical teaching activities, then the MOOC would lose its value and significance. The formulation of the Wushu MOOC should be fully integrated with the national traditional sports practice curriculum, combining the movement skills and theoretical knowledge of Wushu, so as to improve the teaching methods of the MOOC.

d) The principle of targeting

Wushu courses should be designed, adjusted and updated according to the characteristics of teachers and students to ensure the relevance of the content of Wushu courses. At the same time, Wushu courses are offered to students, with a focus on Wushu and national sports, the content of which is to observe students' needs and study habits. Taking improving the learning effect of students as a starting point, the training effect should be maximized, the training quality should be ensured, and the training effect should be improved.

e) The principle of synthesis

In the process of cultivating martial arts talents, it is necessary not only to promote their formation of theoretical and logical thinking, but also to strengthen their understanding of the foundation of martial arts education. The selection of martial arts courses should follow the principle of micro-integration, provide students with professional

theoretical knowledge, and cultivate martial arts-related skills. In the training process, the direction of resource concentration must be determined according to the overall balanced design principle of martial arts courses.

(3) Design of Wushu MOOCs under AI

Under AI, the Wushu MOOC course design is carried out from five aspects, as shown in Figure 4. First, using AI to receive information from a Wushu MOOC, objectives, courses, and references are listed and broken down into modules. Each chapter defines student goals in chapter form, allowing students to customize their learning data. Then, artificial intelligence is used to design a martial arts movement dismemberment course, creating a learning environment for students to gain better knowledge. According to the course evaluation standard, students are inspected from many aspects, so that students can participate more actively in the course and improve their learning motivation [20]. Finally, the theory test is conducted, which is mainly divided into online theory test and offline action test. The online test is automatically changed by the computing system, mainly to test the learning level of the students, while the offline test is for teachers to evaluate and score through the martial arts movements displayed by the students. The above five steps together constitute the MOOC course of Wushu.

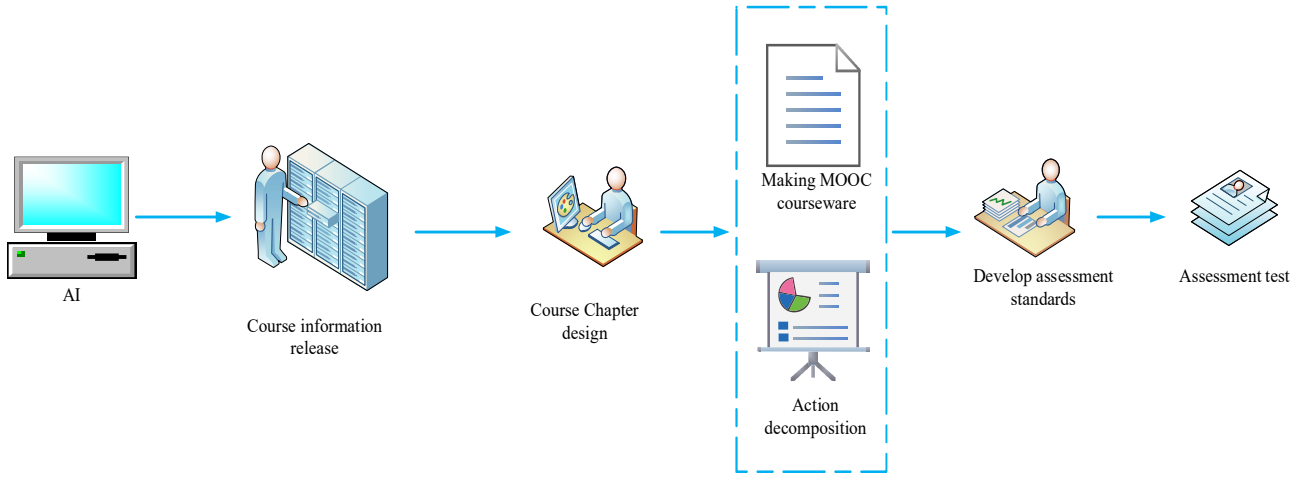

Figure 4: Design of Wushu MOOC course under artificial intelligence

(4) Application design of Wushu MOOC courses

The application of Wushu MOOC is mainly divided into three aspects, as shown in Figure 5.

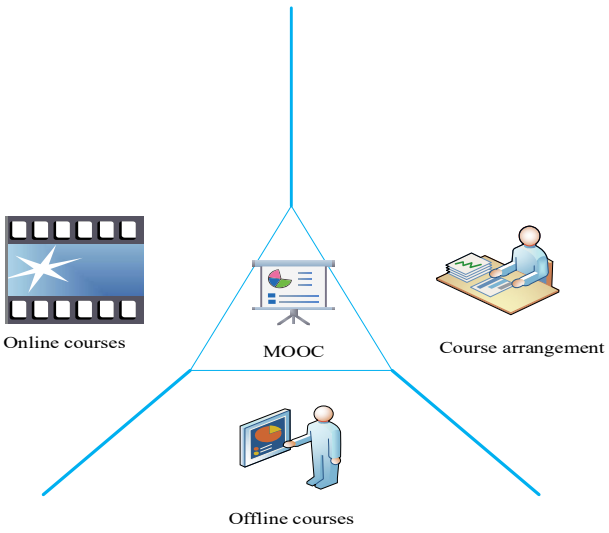

Figure 5: Application Design of Wushu MOOC course

a) Course schedule

When designing online courses, it is necessary to first create a blended learning environment, reasonably arrange online time and offline time, make appropriate use of the diversity of network resources, and use the real

emotional connection between people in the classroom to make up for the emotional deficit of e-learning. Through group practice, mutual corrective actions can help students learn from each other, correct mistakes in movements, improve students' cohesion, and better understand the essentials of martial arts movements. Teachers are responsible for maintaining classroom order and supervising students' learning. When students make mistakes, they correct them in time. When serious problems occur, teachers should take timely measures to help students solve them better.

b) Online teaching of MOOCs

Students can make the most of their time to study MOOCs according to their own circumstances, no matter when and where they study. During the learning process, students can also learn through accelerated playback according to their own conditions and acceptable content. For hard-to-understand content, multiple viewings are required. If the problem is difficult to solve, students can ask the teacher or assistant in the forum. Students can also participate in discussions with other students in order to understand and reflect on their own ideas. After the study, learners can use the timely feedback after class to learn the theoretical knowledge of martial arts, and find mistakes and improve in time, so as to quickly complete the homework after class. In the exam, students can also choose appropriate knowledge points to review according to their needs.

c) MOOC offline teaching

After this week's Wushu MOOC, students practiced according to a schedule set by the school. In the practice process, teachers divide students into small groups (5-6 people in each group), and each group is led by a group leader who is responsible for the technical practice of the MOOC. In the training process, correcting students' wrong behaviors and communicating with each other can not only effectively deepen students' understanding of technical movements, but also improve students' joint learning and progress ability. At the same time, teachers need to maintain classroom order, help students learn, and respond quickly to problems in students' learning process, so as to improve the standardization of students' martial arts movements.

IV. Application of LM Back-propagation Algorithm in Wushu MOOC Curriculum Design

In order to further understand the application effect of Wushu MOOC under AI, this paper analyzes the application effect of Wushu MOOC through Levenberg-Marquardt (LM) back-propagation algorithm (LMBP algorithm). First of all, for the Wushu MOOC, the LMBP algorithm can be set as:

$$A_{M+1} = A_M - \left[B^N \left(A_M \right) B\left(A_M \right) + \alpha_K C \right]^{-1} B^N \left(A_M \right) D\left(A_M \right) \tag{1}$$

Through transformation, the result can be obtained:

$$\Delta A_M = -\left[B^N \left(A_M \right) B\left(A_M \right) + \alpha_K C \right]^{-1} B^N \left(A_M \right) D\left(A_M \right) \tag{2}$$

Among them, *C* is the identity matrix, $D\left(A_M \right)$ is the error vector, and $B\left(A_M \right)$ is the Jacobian matrix. Then, all courses are submitted to the network, and the corresponding output error is calculated as:

$$z_n = t_n - x_n^N \tag{3}$$

$$x^0 = m \tag{4}$$

$$x^{i+1} = f^{i+1}\left(\lambda^{i+1} x^i + d^{i+1} \right), i = 0,1,2,\cdots,N-1 \tag{5}$$

Among them, *m* is the input vector, λ is the weight vector, and *d* is the bias value vector. Then the mean squared error of the MOOC is calculated, and the sum of the mean errors is:

$$F\left(y \right) = \sum_{n=1}^{N} \left(t_n - x_n \right)^N \left(t_n - x_n \right) = \sum_{n=1}^{N} \sum_{j=1}^{Q^i} \left(z_{n,j} \right)^2 \tag{6}$$

The error function gets the error vector as:

$$R^N = \left[r_1, r_2, \cdots, r_I \right] \tag{7}$$

$$Y^N = \left[y_1 y_2 \cdots y_i \right] \tag{8}$$

Then combined with Formula (5), the result can be obtained:

$$R^N = \left[z_{1,1}, z_{2,1}, \cdots, z_{Q^i,1} z_{1,2} \cdots z_{Q^i,2} \cdots z_{1,N} \cdots z_{Q^i,N} \right] \tag{9}$$

$$Y^N = \left[\lambda_{1,1}^1 \cdots \lambda_{1,S}^1 \lambda_{2,1}^1 \cdots \lambda_{2,S}^1 \cdots \lambda_{Q^1,S}^1 d_1^1 \cdots \lambda_{Q^i,Q^{i-1}}^N d_1^N \cdots d_{Q^i}^N \right] \tag{10}$$

Among them, Q^i is the number of nodes in the hidden layer of the course, and the relation can be expressed as:

$$T = N * Q^i, i = Q^1 \left(S+1 \right) + Q^2 \left(Q^1 + 1 \right) + \cdots + Q^i \left(Q^{i-1} + 1 \right) \tag{11}$$

Then the initialized sensitivity can be obtained as:

$$Q_n^i = -F^i \left(\delta_n^i \right) \tag{12}$$

$$F^i \left(\delta_n^i \right) = \begin{pmatrix} f^i \left(\delta_1^i \right) & 0 & 0 \\ 0 & \ddots & 0 \\ 0 & 0 & f^i \left(\delta_{Q^i}^i \right) \end{pmatrix} \tag{13}$$

Recursion sensitivity is calculated as:

$$Q_n^i = -F^i \left(\delta_n^i \right) \left(E^{i+1} \right)^N Q_n^{i+1} \tag{14}$$

Finally, the gradient model of the MOOC course is obtained as:

$$\nabla F \left(y \right) = 2 B^N \left(y \right) d \left(y \right) \tag{15}$$

V. Experiment on the Curriculum Design of Wushu MOOC under AI

In order to further understand the teaching effect of Wushu MOOC under AI, the teaching effect was analyzed under the LM back-propagation algorithm. This paper selects teachers and students of a school to investigate the satisfaction of the Wushu MOOC curriculum design, as shown in Table 1.

Table 1: Satisfaction of teachers and students with the design of Wushu MOOC course

	Satisfied	Commonly	Dissatisfied
Teacher	82	12	6
Student	76	15	9
Total	158	27	15

It can be seen from the table that teachers and students have relatively high satisfaction with Wushu MOOCs. In the eyes of teachers, Wushu MOOC can fully plan and design the courses, and split and explain Wushu movements, which is very conducive to students' learning and viewing, and can also be assessed online, and reduces the work of teachers to a certain extent; for students, martial arts MOOCs can be watched anytime and anywhere, and they can also be watched repeatedly in unfamiliar places. At the same time, the design of the course is more in line with the students' learning psychology.

(1) The time invested by students in MOOC courses under AI to analyze the learning effect

In order to further understand the use effect of Wushu MOOC, this paper analyzes the proportion of students' investment time and learning effect through AI, as shown in Figure 6.

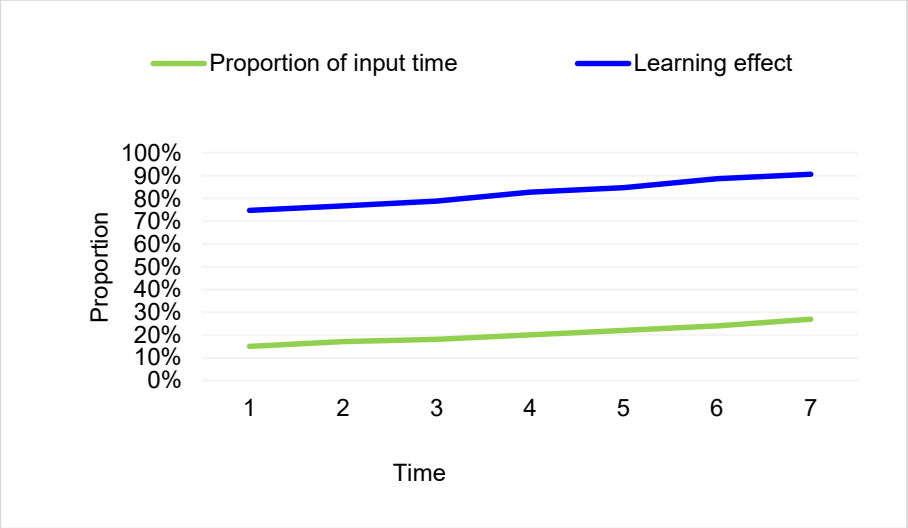

Figure 6: Analysis of students' input time and learning effect in MOOC class under artificial intelligence

It can be seen from the figure that with the increase of time, the learning effect of the students gradually increases, and the students invest more and more time in the Wushu MOOC. All these show that AI is very helpful for the design of MOOCs. Students can use the MOOC to learn Wushu reasonably according to their own schedule, and the overall curriculum design of the Wushu MOOC is also in line with the students' learning psychology, which also promotes students' enthusiasm for learning Wushu.

(2) Experimental analysis of LM back-propagation algorithm in Wushu MOOC course design

In order to understand the practical effect of Wushu MOOC course design, this paper analyzes the recursive sensitivity and gradient modulus of its course through the LM back-propagation algorithm, as shown in Figure 7.

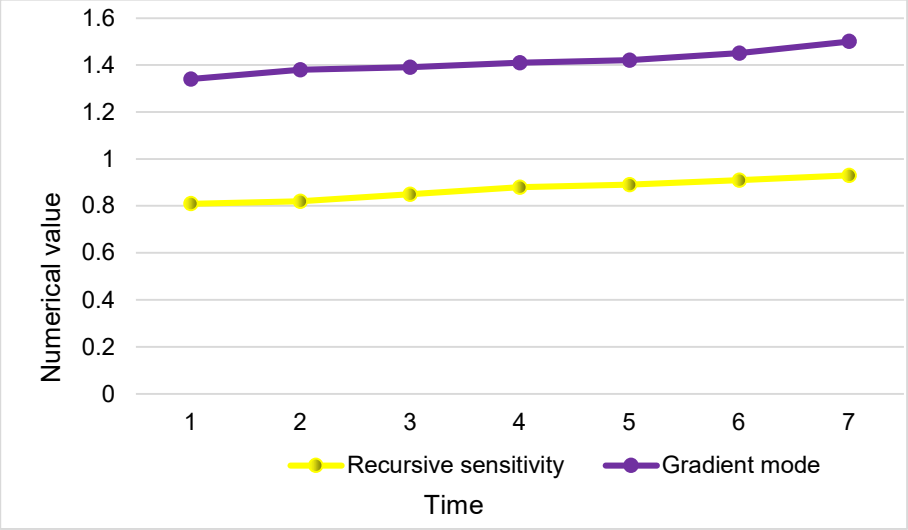

Figure 7: Experimental analysis of LM back propagation algorithm in the design of Wushu MOOC course

It can be seen from the figure that with the increase of time, the recursive sensitivity and gradient modulus of Wushu MOOC are gradually increasing, and the average value of recursive sensitivity is about 0.87, and the average value of gradient modulus is about 1.41. The continuous growth of both shows that the curriculum design of Wushu MOOC under AI is positively related to students' learning effect. The combination of the two can jointly analyze students' comprehensive evaluation of Wushu MOOC, so as to improve the curriculum design of Wushu MOOC according to students' evaluation, and improve students' learning efficiency.

(3) Analysis of the teaching effect and students' initiative of Wushu MOOC under AI

In order to test the teaching effect of the Wushu MOOC course under AI, this paper also conducts a comparative study with the teaching effect of traditional Wushu course and students' initiative, as shown in Figure 8.

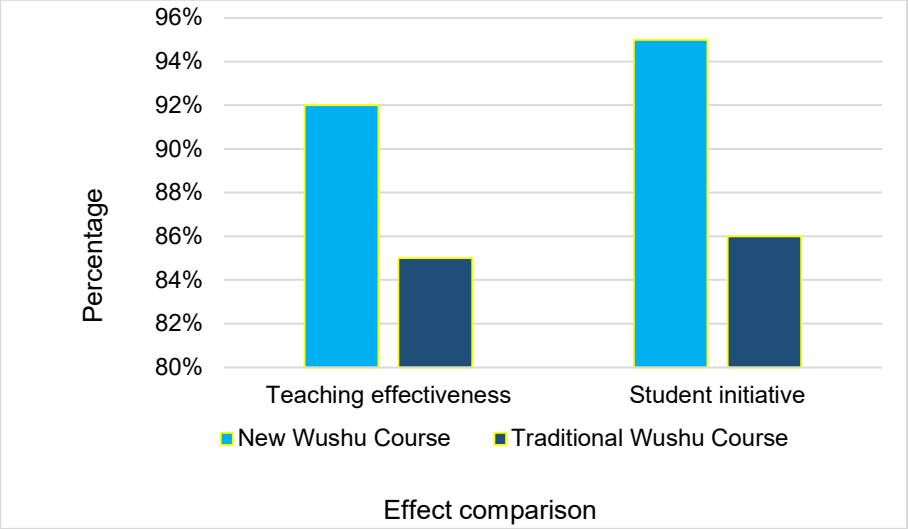

Figure 8: Analysis of teaching effect and students' initiative of Wushu MOOC course under artificial intelligence

According to the figure, the teaching effect and students' initiative of Wushu MOOC under AI are higher than those of traditional Wushu courses, and the teaching effect is about 7% higher, and the students' initiative is 9% higher. The new martial arts course focuses on the combination of theory and practice, combining online and offline. Students can also watch the decomposition movements of martial arts repeatedly anytime and anywhere, and they can also discuss and communicate with teachers and other students in the discussion area, and finally master the essentials of various movements of martial arts and fully display the martial arts. However, in traditional martial arts courses, teachers demonstrate movements, and then students learn and communicate with each other. They cannot master the essentials of movements well, so students' initiative would be poor.

VI. Conclusions

Martial arts is a highly practical course. Through video teaching, more intuitive martial arts techniques or theoretical knowledge points can be used as a practical course. It can also show students the technical or theoretical knowledge of martial arts more vividly, and the key to improving the technical level lies in practice. Therefore, when designing Wushu courses, the design principles based on the characteristics of Wushu MOOCs through AI technology emphasized the combination of interest and innovation and the pertinence of course content. The principle of combining teaching activities and application programs was adhered to. Taking into account the combination of AI technology and MOOC design, it is necessary to insist on using it as a means for students to enter the immersive mode and improve the teaching effect.

References

[1] Wang B. Missing and Remoulding of Cultural and Educational Factors in Martial Arts Teaching[J]. Journal of Shenyang Sport University, 2018,14(4):12-16.
[2] Deng L, Pu Y. Analysis of college martial arts teaching posture based on 3D image reconstruction and wavelet transform[J]. Displays, 2021, 69(1):102044-102049.
[3] Ju Y. Chinese–English Translation of Martial Arts Terms In Intercultural Communication[J]. Campus English, 2017,15(1):3-10.
[4] Chen S, Liang L. Online resource sharing of martial arts teaching based on 5G network and FPGA system[J]. Microprocessors and Microsystems, 2020,12(8):103447-103451.
[5] Zhang N. The application of outreach training in college martial arts teaching[J]. Heilongjiang Science, 2018,12(4):142-146.
[6] Chen P. Research on the Present Situation of Martial Arts Teaching Among Primary and Middle Schools in Yancheng City[J]. Hubei Sports Science, 2017,4(5):1-6.
[7] Duan L, Dai G. Reflections on the Controversy Over Martial Arts's Teaching in Schools[J]. Journal of Capital University of Physical Education and Sports, 2019,224(6):254-259.
[8] Maduabuchi C. Thermo-mechanical optimization of thermoelectric generators using deep learning artificial intelligence algorithms fed with verified finite element simulation data[J]. Applied Energy, 2022, 315(8):118943-118949.
[9] M Lidia Alcala, Antonio R J, Gupta R T. Artificial Intelligence-assisted Prostate Cancer Diagnosis: Radiologic-Pathologic Correlation[J]. Radiographics: a review publication of the Radiological Society of North America, Inc, 2021, 41(6):1676-1697.
[10] Na J Y, Kim D, Kwon A M. Artificial intelligence model comparison for risk factor analysis of patent ductus arteriosus in nationwide very low birth weight infants cohort[J]. Scientific Reports, 2021, 11(1):14-19.
[11] Bukret W E. A Novel Artificial Intelligence–assisted Risk Assessment Model for Preventing Complications in Esthetic Surgery[J]. Plastic and Reconstructive Surgery - Global Open, 2021, 9(7):3698-3699.

[12] Sausen A, MD Campos, Sausen P S. Classification of the social distance during the COVID pandemic from electricity consumption using artificial intelligence[J]. International Journal of Energy Research, 2021,20(2):147-151.
[13] Jones O T, Calanzani N, Saji S. Artificial Intelligence Techniques That May Be Applied to Primary Care Data to Facilitate Earlier Diagnosis of Cancer: Systematic Review[J]. Journal of Medical Internet Research, 2021, 23(3):23483-23492.
[14] Visaggi P, Barberio B, Ghisa M. Modern Diagnosis of Early Esophageal Cancer: From Blood Biomarkers to Advanced Endoscopy and Artificial Intelligence[J]. Cancers, 2021,13(1):24-28.
[15] Madubueze C C, Chukwu C, Omoke N I. Road traffic injuries as seen in a Nigerian teaching hospital[J]. International Orthopaedics, 2019, 35(5):743-746.
[16] Matovelo D, Magoma M, Rambau P. HIV serostatus and tumor differentiation among patients with cervical cancer at Bugando Medical Centre[J]. BMC Research Notes, 2018, 5(1):406-408.
[17] Isaac O N, Nwite I M. Analysis of risk factors for depression among patients with chronic low back pain in an orthopaedic clinic of a Nigerian teaching hospital[J]. African health sciences, 2020,19(1):1727-1735.
[18] Mokel M J. A course design format to facilitate teaching research online to RN - BSN students[J]. Teaching and Learning in Nursing, 2021, 16(2):14-29.
[19] Ba H K. The Effect of Critical Thinking Embedded English Course Design to The Improvement of Critical Thinking Skills of Secondary School Learners[J]. Thinking Skills and Creativity, 2021, 41(12):100910-100918.
[20] Tualaulelei E, Burke K, Fanshawe M. Mapping pedagogical touchpoints: Exploring online student engagement and course design[J]. Active Learning in Higher Education, 2021,15(1):146-152.