International Journal of Computer Information Systems and Industrial Management Applications
ISSN 2150-7988 Volume 18 (2026) pp. 1-15

https://doi.org/10.70917/ijcisim-2026-0033
Article

Discussion on the Integration of Ethnic Art Teaching and College Curriculum Civics Based on Augmented Reality Technology

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Abstract: The application of AR technology provides a new direction for integrated teaching in colleges and universities. In this paper, we build a national art and course ideology teaching system integrating augmented reality technology to improve students' sense of national cultural identity. Based on Cardinal spline curve to complete the design of the movement path of ethnic dance movements. Combined with the visual synchronous localization and mapping (SLAM) localization tracking and the improved natural feature tracking registration of the optical flow method, it improves the positioning accuracy of the dance movements and realizes the multi-view observation of the virtual dance characters. It is shown that the motion target tracking accuracy of this paper's method reaches 0.970 and the success rate is up to 0.993, which is better than the comparison algorithms. The system has only 2-3 recognition errors in 2 out of 7 tasks, and the average score of learning effect is greater than 10. After applying the system to assist learning, the experimental class students' interest and ability to learn ethnic art significantly increased at the 0.01 level, effectively realizing the organic penetration of immersion perception of ethnic culture and curriculum politics.

Keywords: augmented reality; ethnic art teaching; curriculum ideology; Cardinal spline curve; visual SLAM localization

1. Introduction

With the development of the times, ethnic art education has also been integrated into China's art education system as a unique form of art education [1]. There is a difference between knowledge and practice in this type of art education. Usually, traditional art education focuses on practice, i.e., it pays more attention to the skill training of a certain art discipline. Before the formalization of art, the training of artists was mainly by teacher and apprentice [2]. But this kind of training is incomplete, because only the skills can not become a real artist. A true artist must also have the cultivation of thought and culture in order to create works worthy of the times.

Augmented Reality (AR), a computer application system that has developed rapidly in recent years, is based on virtual reality processed through network technology and thus realized as a superimposition of a completely virtual world with the real world [3-4]. Augmented reality means that in some scenes appear to be real, the fusion of virtual reality and augmented reality is AR technology [5]. It is because it can meet the people in the daily reality can not touch in depth, so with the development of science and technology has also made the use of AR technology has been widely recognized and supported, whether it is teaching, medical simulation, industrial manufacturing simulation, etc., have brought the user a very convenient function [6-8].

AR technology can be used in many ways, in which the application of art education and training has been gradually developed. Literature [9] explored the feasibility of augmented reality (AR) technology in early art education, and found that the technology can improve students' participation and interest in art, and was supported by relevant parties. Literature [10] pointed out in their study that AR technology is a technology that combines digital content with the real world, which can enhance perceptual effects and provide immersive and interactive experiences, thus changing the traditional way of learning, and has a wide range of applications in the field of education. Literature [11] describes the development and testing of an “AR-enabled teaching” platform, which is designed to guide students to understand effective augmented reality applications, and the test results show that augmented reality has a promising future in the field of education. Literature [12] explores the possibility of applying AR technology in music and art education, which proposes an interdisciplinary knowledge system and practical design concepts to expand the scope of application of AR technology in the field of music and art education. Synthesizing the above related research, we can see that for art students, AR technology transforms the previous two-dimensional to a more three-dimensional three-dimensional, which is a breakthrough in the previous teaching and breaks through the spatial limitations, which makes the whole teaching environment a huge improvement compared with the traditional mode.

This paper utilizes augmented reality technology to create a virtual interactive system to support the deep interaction of ethnic art and the organic integration of Civic and political elements. Cardinal spline curves are designed to realize smooth movement and multi-view interaction of virtual dance characters through closed loop and multi-control point constraints. Relying on visual SLAM and optimized optical flow tracking, we realize the virtual dance character's position anchoring in the real scene, and overcome the change of view angle and occlusion interference. Synthesize the augmented reality technology and system, and innovate the teaching method of “combining performance and learning” and other ethnic art and curriculum ideology and politics. Through testing and practicing, the teaching aid effect of the proposed method and the constructed system is examined.

2. Augmented Reality Realization of the Integration of National Art Teaching and University Curricular Ideology

2.1. Multi-Perspective Observation of Ethnic Art Based on Movement Paths

2.1.1. Spline Curve Motion Path Design

In the process of ethnic dynamic art display, the virtual character model needs to walk from the starting point located at the back of the logo map to the initial point of the dance display located at the front of the logo map, and after the completion of the dance display, it needs to walk from the initial point of the dance display to the end point located at the back of the logo map, in which the starting point and the end point are overlapped, therefore, the walking path of the virtual character model should be designed as a closed spline curve. And because the starting point (end point) P_0, the initial point of the dance display P_3, and the four points with larger curvature on the closed motion path (P_1, P_2, P_4, P_5) need to be set up with the control points of the spline curve (all the control points are coplanar), this paper adopts a closed cardinal curve with the total number of control points as 6, and the control points of the closed spline curve as 6. Therefore, in this paper, we use the closed Cardinal spline curve with a total number of 6 (all its control points are coplanar) to design the motion path of the virtual character model. Figure 1 shows the motion path of the spline curve designed in this paper. According to the segmental interpolation method, as long as the set of control points $\{P_0, P_1, P_2, P_3\}, \{P_1, P_2, P_3, P_4\}, \{P_2, P_3, P_4, P_5\}, \{P_3, P_4, P_5, P_0\}, \{P_4, P_5, P_0, P_1\}$ $\{P_5, P_0, P_1, P_2\}$ generates corresponding spline curve segments, which can be connected segment by segment to become a closed spline curve.

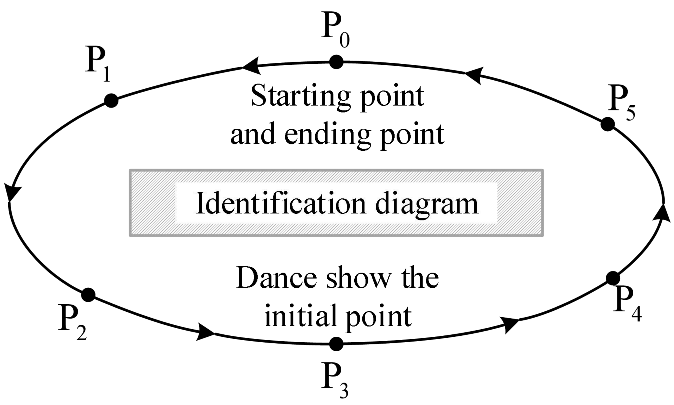


Figure 1. Spline curve path.

The tensor parameter t in the parametric cubic function of a Cardinal spline is used to control the degree of relaxation between the spline and the input control points ($t < 0$ for "loose curves", $t > 0$ for "tight curves"), which affects the shape of the path of the shape of the motion path of the spline curve is affected. In order to demonstrate the influence of the tensor parameter t on the shape of the spline path, Figure 2 shows a comparison of the shapes of the closed Cardinal spline paths when the tensor parameter t is equal to -2.0, -1.0, 0.0, 1.0, and 2.0 (the control points are all in the same plane and are labeled with small squares).

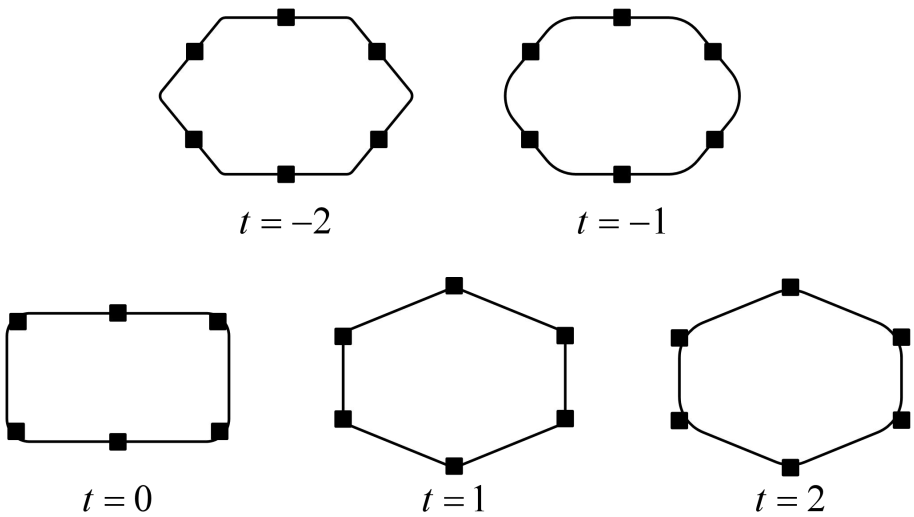


Figure 2. The influence of tensor t on the path shape.

As can be seen in Fig. 2, when $t = 0.0$, the Cardinal spline curve (at this time also known as the Catmull-Rom spline curve) at the control point and the transition between neighboring control points is smooth, there is no obvious sense of defect, so this paper uses the closed Catmull-Rom spline curve to plan the movement path of the virtual character model in the national dynamic art display system. When $t = 0.0$, from the relation $s = (1-t)/2$ to get s, we get the cubic function equation of Catmull-Rom spline curve:

$$
\begin{aligned}
F(u) &= \frac{1}{2}(P_{k+2} - 3P_{k+1} + 3P_k - P_{k-1})u^3 \\
&+ \frac{1}{2}(-P_{k+2} + 4P_{k+1} - 5P_k + 2P_{k-1})u^2 \\
&+ \frac{1}{2}(P_{k+1} - P_{k-1})u + P_k \quad (0 \le u \le 1)
\end{aligned} \tag{1}
$$

Using the cubic function equation (1), the corresponding Catmull-Rom spline curve segments can be generated, and finally connected segment by segment to become a closed Catmull-Rom spline curve by segment interpolation method.

In this section, the spline curve motion path is set in the world coordinate system with the center point of the bottom edge of the marking map as the origin (its control points are all in the XOZ plane). Figure 3 shows the relative position relationship between the spline curve motion path and the logo map.

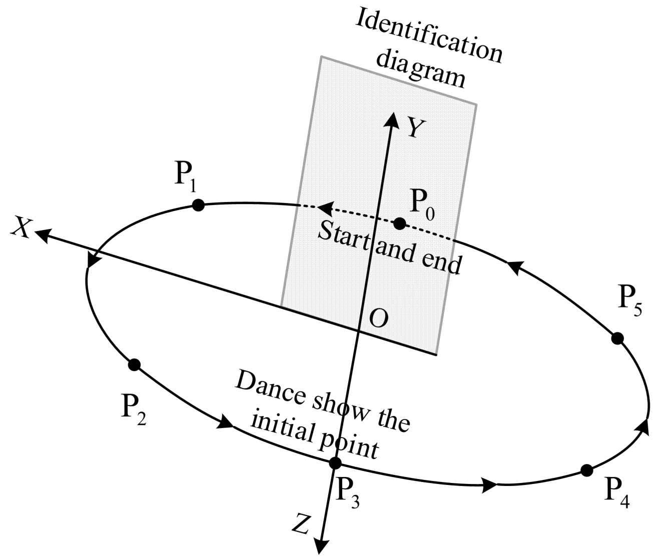


Figure 3. The position of the movement path relative to the identification map.

2.1.2. Designing a Multi-Perspective View of Ethnic Art

If this system can only display the folk dance from a fixed perspective, then students will not be able to observe the folk dance from all angles, which is not conducive to the enhancement of the student experience, so this system provides an interactive way to be able to observe the dancing body movements of the virtual character model from multiple perspectives.

Figure 4 shows the relative position of the virtual character model and the logo map during the animation state of the folk dance. By rotating the character model around the Ym axis in the local coordinate system established with the soles of the character model as the origin, students can observe the folk dance from multiple perspectives.

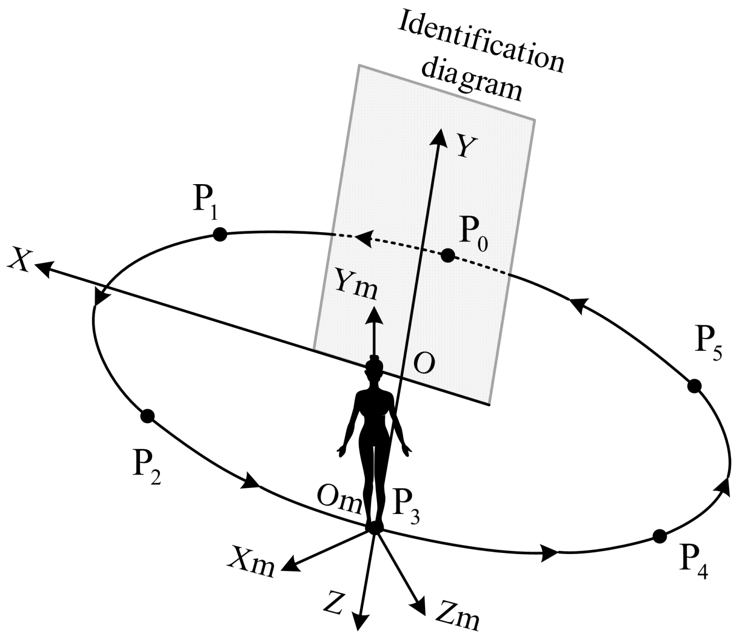


Figure 4. Position of the virtual character model relative to the identification diagram.

From computer graphics, the rotation transformation matrix for a θ angular rotation around the Y_m axis in the left-handed coordinate system is:

$$R_y(\theta) = \begin{bmatrix} \cos\theta & 0 & \sin\theta & 0 \\ 0 & 1 & 0 & 0 \\ -\sin\theta & 0 & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{2}$$

By adjusting the parameter θ in this rotational transformation matrix, students can realize a multi-perspective way of viewing folk dance.

2.2. Visual SLAM-Based Augmented Reality Registration Approach

Visual SLAM is one of the hot research topics in today's world, and the birth of related hardware devices with attached sensors has both driven the progress of SLAM and brought new opportunities for the development of augmented reality. Figure 5 shows the basic flow of vision SLAM, which is mainly composed of image data reading, visual odometry (VO), nonlinear optimization, loopback detection and map building.

1) Image data reading. Reading and pre-processing the image information captured by the camera is the first step of visual SLAM, which is also the cornerstone of the entire SLAM to successfully complete the localization tracking, and the quality of the image data acquisition will have an impact on the processing of the subsequent steps. The current mainstream image data acquisition methods generally use three cameras: monocular camera, binocular camera and depth camera.

2) Visual odometry. The camera captures the image data of neighboring image frames and passes it through the visual odometry to calculate the position change relationship, and Ran uses the position change relationship to get the motion of the camera between the two images, which is also known as the front-end in visual SLAM.VO generally has a direct method front-end and a feature point method front-end. The direct method usually uses the gray value information to estimate the camera's position change process. This method does not require feature point extraction and directly utilizes the information obtained from all cameras, so it requires GPU for accelerated data processing to improve the operation efficiency. The feature point-based visual odometry estimation only needs to extract feature points from the image, and then get the camera motion process based on the one-to-one correspondence of feature points in neighboring frames. Visual mileage estimation based on feature points is insensitive to light and dynamic environment, which is the mainstream direction of research nowadays.

3) Nonlinear optimization. Nonlinear optimization is the back-end part of the whole visual SLAM framework, which is mainly responsible for the optimization of the front-end visual odometry estimation results, and generally adopts the filtering theories such as Extended Kalman Filtering, Particle Filtering, and Traceless Karl for optimization, which can finally get more accurate position estimation.

4) Loopback detection. In some fields, loopback detection, also known as closed-loop detection, is generally used to deal with the phenomenon of tracking loss brought about by the camera in the case of too fast motion and too large visual changes. In order to realize loopback detection, according to take the obtained image information to determine whether the current scene has been visited before, correct the error generated by VO, so that the map information is consistent. When loopback detection is carried out, the current scene has been visited is fed back to the nonlinear optimization part of the back-end, and the back-end corrects the estimated trajectory according to this information to make it close to the result of the loopback detection, so that some cumulative errors can be eliminated, and the accuracy of the running trajectory estimation can be improved. Currently, bag-of-words model (BoW) is the main closed-loop detection mechanism.

5) Map building. Map building can be said to be the ultimate purpose of vision SLAM, which is a description of the current real environment after a series of data acquisition. Broadly speaking, map building is generally categorized into two ways: topological maps and metric maps. Topological maps are not good at representing the specific positional relationship of objects, it divides the map to form nodes and edges, and focuses on the expression of the relationship between map elements. Metric maps can accurately represent the positional relationships of all objects on the map, and are categorized into dense and sparse maps according to the complexity of the map content.

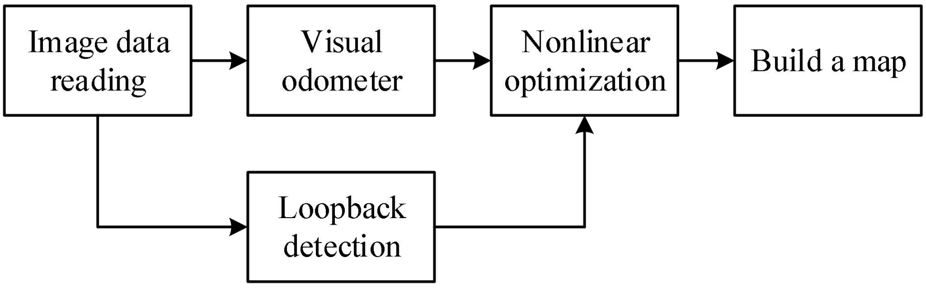


Figure 5. Visual SLAM process.

Visual SLAM can estimate the camera position change by recovering the motion trajectory when the scene is unknown with high stability. AR tracking registration is realized by combining SLAM algorithm. To realize 3D virtual registration based on vision SLAM, it is necessary to extract feature points in the image, and then match the extracted feature points to get the camera position information, so as to complete the tracking registration of virtual objects. However, the visual SLAM algorithm adopts the global matching of feature points, which has a large search range and is time-consuming; moreover, when the camera moves too fast and the view angle changes drastically, the matching feature points of the two neighboring frames plummet, and the accuracy of the camera position estimation decreases drastically, which results in a reduction of the registration accuracy and a drifting phenomenon. Therefore, the feature point matching method is improved on the basis of the traditional visual SLAM to improve the matching efficiency; the accuracy can also be improved in the camera position solving, and finally realize the 3D registration with higher efficiency and accuracy.

2.3. Tracking Registration Based on Natural Features

2.3.1. Tracking Enrollment Based on Natural Features

In real application environments, environmental factors such as light brightness, photo angle and occlusions will have an impact on the processing accuracy of WebAR applications, and the tracking and registration technique of natural features can not only effectively avoid the above problems, but also has strong robustness. Compared with the traditional marker-based tracking method, the tracking implementation using natural features is difficult, but it can ensure the overall natural features in the actual scene.

The traditional tracking registration method based on natural features is mainly divided into two parts, the preprocessing stage and the online stage. In the preprocessing stage, the reference image needs to be preprocessed so that it can be matched with the features in the current stage, and the feature extraction algorithm is used to detect and describe the feature points. In the online stage, the feature extraction algorithm is also required to extract the feature points of the video frames in the video stream, perform the feature description, and judge whether the reference image exists in the acquired video frames by matching with the reference image; if the reference image is not matched, the feature extraction matching of the video is carried out again: if the reference image exists, then it will be filtered through the RANSAC according to the feature points that are matched successfully. Matching results, through the set threshold to determine whether to directly carry out the position calculation, such as greater than the set threshold for motion estimation for the calculation of the transformation matrix, which can effectively overcome the conventional method of occlusion and other problems, and finally render the virtual model and show the WebAR effect. Figure 6 shows the flow of the tracking registration method based on natural features.

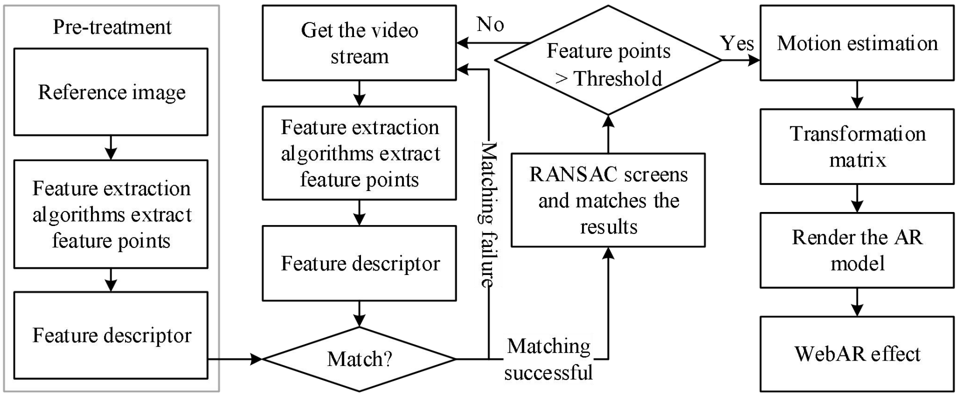


Figure 6. Process of the tracking and registration method based on natural features.

In the process of researching the feature detection and matching algorithm, it is found that there are some shortcomings in the method of completing the tracking registration by only using the feature points, which needs to detect and match the features of the video frames in the video stream one by one, and with the continuous input of the video stream, this continuous process will increase the computational pressure of the whole system, and the computational time will be long: the effect of the detection of the target area will be affected by the detection time as well as the environmental factors. The effect of target area detection will be affected by the detection time and environmental factors, due to the detection of less feature information of the target's feature area, and easy to be interfered by non-target information, which leads to the reduction of the matching accuracy, and then affects the accuracy of the camera attitude estimation, and affects the tracking registration effect.

2.3.2. Improved Optical Flow-Based Tracking Registration

The tracking registration method based on feature optical flow also has some problems, when the detected target exceeds the detection boundary as well as when the detected points of interest are occluded by non-target objects in the current space, it will result in a large number of feature points being lost, which in turn affects the accuracy of tracking, and thus ultimately prevents the completion of accurate virtual registration. Therefore, the following improvements are made to address the existing problems, and Fig. 7 shows the specific improvement process.

1) The optical flow real-time tracking and registration method studied in this section has a relatively large dependence on the information extracted from the initial feature points, and in order to realize the stability and reliability of the tracking and registration results, its feature points need to have obvious characteristics that can facilitate information extraction. AKAZE algorithm is used for feature extraction, and RANSAC is used to screen the matching results in order to obtain uniformly distributed and accurately positioned feature points as the tracking points used in the optical flow method tracking.

2) In the process of tracking feature points by optical flow, it is easy to have the change of view angle, the existence of occlusions, and the tracked object exceeding the boundary of the camera, which leads to the loss of some feature points, and if it is not sampled twice, it will cause the number of feature points to keep decreasing, which leads to the failure of tracking registration. In order to solve this problem, a threshold is set in the process of calculation, and when the number of feature points is less than the threshold, the feature points are re-sampled and the spatial point coordinates are re-initialized, which ultimately ensures the stability and accuracy of the tracking registration of the optical flow method while also ensuring the speed and efficiency of the calculation.

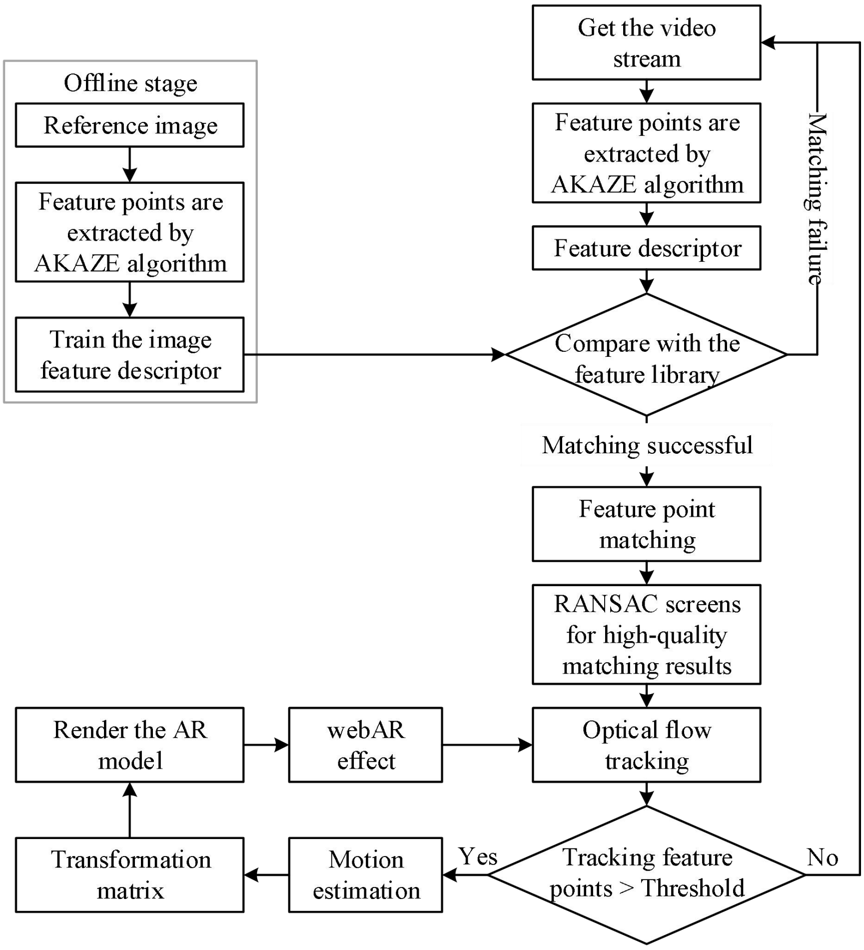


Figure 7. Improved tracking registration based on optical flow method.

2.4. Innovative Teaching Methods and Approaches to Ethnic Arts

The design of teaching methods and approaches of ethnic art courses based on augmented reality technology is one of the important links in the construction of the curriculum, and the innovation of teaching methods and approaches of ethnic art education in accordance with local conditions is conducive to improving the dilemma of the solidification of the teaching mode of ethnic art education in schools.

Ethnic art is often fused with ethnic traditional sports, such as the bamboo pole dance that the Jing people like to dance, which is not only a very beautiful ethnic dance, but also an ethnic traditional sports program that strengthens the body and enhances the dancer's perception of ethnic culture. Therefore, in physical education classes and recesses, group art and sports activities based on the integration of ethnic art and sports with augmented reality technology and a wide audience are carried out to solve the problems of small surface of students' participation in ethnic art activities, emphasizing the minority rather than the whole, and competitions rather than popularization. Ethnic art performance is an important form and content for schools to carry out the practice of ethnic art education, and to establish the teaching method of "promoting learning through performance". The ethnic art performance program is connected with the ethnic art education curriculum, reflecting the whole-member and group nature, the stage of the performance belongs to every student, and every student has the opportunity to participate in the ethnic art performance. Students voluntarily form different types of ethnic art student clubs according to their interests and hobbies, and relying on club activities, under the leadership of club instructors, they utilize augmented reality technology to complete multi-perspective designs such as ethnic dances, so as to better carry out a variety of ethnic art learning.

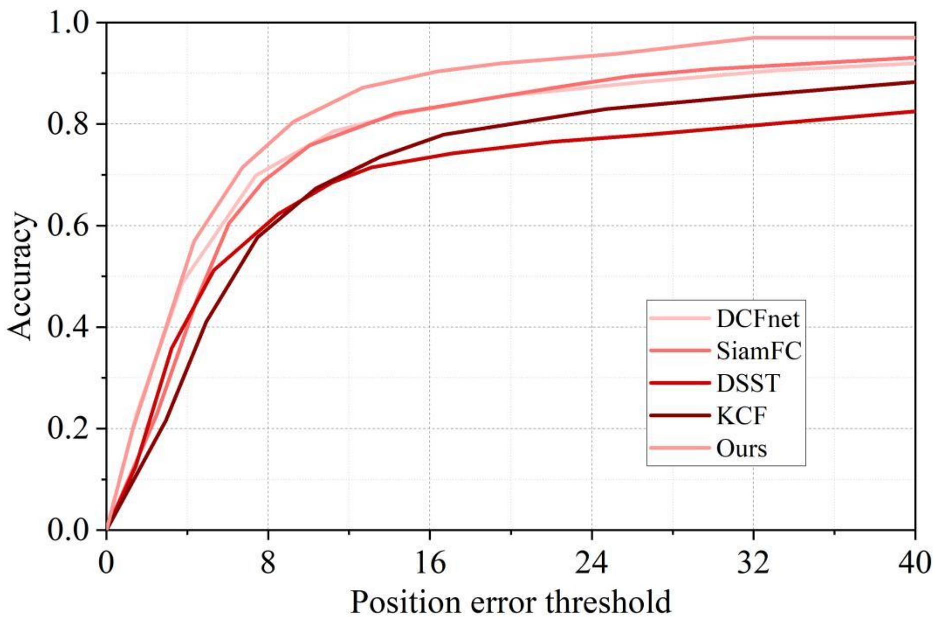
The school innovates new patterns of ethnic art education, carries out "Internet + ethnic art education", and implements "online + offline" hybrid teaching. Through augmented reality technology, different dance movements are designed with students and uploaded to the national art teaching system, which is convenient for students to view and assist in practice at any time and anywhere, breaking through the time and space limitations of traditional teaching, combining traditional teaching with online teaching, and combining unified learning time with fragmented learning time, so as to expand the time and space for teaching national art education. Intangible cultural heritage contains the genes of Chinese civilization and is the link of national emotions. The school has set up an intangible cultural heritage project training base, combined with augmented reality technology to provide "intangible heritage" special visualization courses, and introduced ethnic art intangible cultural heritage into the school and classroom. Representative inheritors of intangible cultural heritage are invited to conduct on-site demonstration lectures, and students engage in experiential learning of "intangible cultural heritage" to experience the vastness and profoundness of Chinese civilization intuitively and enhance their knowledge of Chinese civilization. The "intangible heritage" special courses have not only enriched the content of national art education, but also promoted the living transmission of intangible cultural heritage and raised the level of students' spiritual civilization.

3. Application of Augmented Reality Technology in University Teaching and Learning

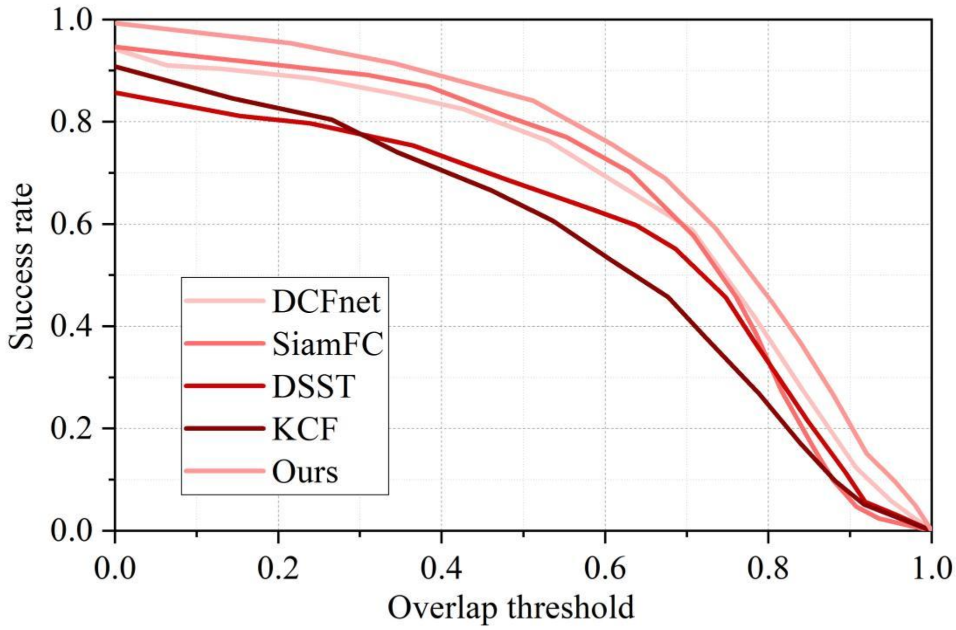
3.1. Motion Target Tracking Results and Analysis

The experiments are conducted by labeling the location of the target in the first frame on the visual tracking benchmark dataset OTB2023, qualitatively analyzing the video sequences for substantial variations, and quantitatively comparing the performance of different tracking algorithms in terms of tracking accuracy and efficiency by comparing the method of this paper with the deep learning algorithms DCFnet, SiamFC, and the correlation filter algorithms: DSST, KCF, and others. . Qualitative and quantitative experiments are conducted to compare and analyze the method of this paper with algorithms SiamFC, DSST, etc. on a sequence of video datasets containing similar background, occlusion, fast motion, and motion blur attributes.

In order to more clearly represent the tracking performance of each tracking algorithm based on two metrics the algorithms are evaluated by initializing the exact position of the real ground in the initial video frames and then obtaining the One Pass Evaluation (OPE) results, which in turn compares the method of this paper with other tracking algorithms with better performance. Figure 8 shows the accuracy and success rate of each algorithm under the OTB2023 benchmark. In the accuracy rate index, the accuracy of this paper's method is stabilized at 0.970 when the position error threshold reaches 32, which is higher than the comparison algorithms DCFnet (0.920), SiamFC (0.931), DSST (0.825), and KCF (0.883). In terms of the success rate index, the method in this paper has the highest success rate of 0.993 and the largest area under the curve of the success rate. The augmented reality technique based on improved optical flow in this paper has better target tracking effect for folk dance movement.



(a) Accuracy



(b) Success rate

Figure 8. Accuracy and success rate under the OTB2023 benchmark.

3.2. Augmented Reality System Fluency and Learning Effect Test

3.2.1. System Smoothness Test

This section sets up fluency and learning effect tests as a way to determine the level of interactive performance of the system in this paper. This experiment describes the fluency of the system by three metrics: the number and length of times the system responds to student interaction jams and the number of times the system recognizes errors in student input. The lag time was recorded by a stopwatch, and the number of lags and the number of misrecognitions were recorded by manual counting. The fluency of the system is mainly reflected in the operations such as recognizing the plane, students' two-finger operation to zoom in and out the virtual dance character, and students' turning the phone in four directions to make the virtual dance character make correct and smooth movements. Specifically, it includes seven tasks: using the application to recognize the plane, placing the virtual dance figure; two-finger control of the model size; students rotate the phone back and forth, the virtual dance figure's feet move alternately; students rotate the phone left and right, the virtual dance figure's hands move alternately, and so on.

Table 1 shows the results of the system fluency test. The system showed good fluency in the 7 tasks, and in tasks 1-5, the number of times that the 50 test students encountered lag and recognition errors was 0 times. In task 6 and 7 students also did not encounter lag, only individual test students failed in making the 1st interaction, most of the test students who failed in recognizing the 1st interaction succeeded in the 2nd attempt, and only one student finally succeeded after 3 attempts, which was due to the accuracy of the inertial sensor of the cell phone, which could only be improved using algorithms and could not be completely eliminated. The data in Table 1 shows that although the interactive system uses augmented reality technology, which the students have not been exposed to, the overall use of the students is good, and the system operates smoothly, ensuring the comfort of the test students when using it.

Table 1. Test results of system smoothness.

Interactive task	Test number	Number of lags	Lag duration	Number of errors identified by the system
Task 1	50	0	0	0
Task 2	50	0	0	0
Task 3	50	0	0	0
Task 4	50	0	0	0

Task 5	50	0	0	0
Task 6	50	0	0	2
Task 7	50	0	0	3

3.2.2. Testing of Systematic Learning Effects

This system is based on the need to develop the integration of ethnic arts and curriculum ideology, so the learning effect test is important for the effectiveness of the application of this system. Learning effect is affected by multiple influences of personal social, educational, life and educational experiences, so this experiment adopts a combination of both subjective and objective evaluation. The subjective evaluation is the subjective score of the tester's learning and use (out of 15 points), while the objective evaluation is designed to design 15 test questions (out of 15 points) related to the learning and use of the system for the tester to answer, and the average of the two scores as the result of this test, the passing score is 10 points, and the average score is greater than 10 points is considered to be qualified.

The participants of the test completed both evaluations. Table 2 shows the results of the system learning effectiveness test. The system obtained high learning effect scores, with the highest individual score being 13 and the lowest being 10. 50 students who participated in the test obtained an average learning effect score greater than the pass mark of 10. The final learning effect of students can be improved by utilizing the integration system of ethnic art teaching and course ideology based on augmented reality technology.

Table 2. Test results of the system learning effect.

Tester number	Subjective score	Objective score	Personal score	Average score
1-10	10,12,13,10,12,13,12 ,10,10,12	10,12,12,12,10,12,10,10 ,12,12	12,12,12,10,13,12 ,10,10,13,12	>10
11-20	12,12,12,10,10,12,10,12, 10,10	10,12,10,10,12,10,1 0,12,12,12	13,12,10,12,10,13,1 0,12,10,10	
21-30	10,12,12,12,10,12,10,12,12, 10	10,10,10,12,10,12,1 0,12,12,10	10,13,13,12,10,12,12,12,12, 12	
31-40	10,11,13,12,10,12,10,10,10, 13	12,12,13,10,10,11,1 2,13,13,12	11,12,12,10,11,10,10,11,11, 10	
41-50	11,13,10,12,12,12,11,11,10, 11	12,12,12,11,11,11,1 1,10,10,10	10,11,12,12,12,10,10,10,11, 11	

3.3. Teaching Practices for Integrating Ethnic Arts and Curriculum Civics

3.3.1. Comparison of the Scores of Students' Interest in Learning Ethnic Arts in the Two Groups before Teaching Practice

An ethnic art teaching system that integrates augmented reality technology and curriculum ideology content was applied to the ethnic dance program in college A for a 1-semester control teaching. Control group: 25 people, using traditional teaching methods for teaching. Experimental group: 25 people, using the system of this paper to assist teaching. There were no variables other than the teaching system.

In the research process, a folk dance learning interest questionnaire was first designed, the questions in the questionnaire were mainly related to the students' interest in learning folk dance, and there were a total of 25 questions, through which the students were evaluated whether they possessed a high degree of interest or not. The questionnaires in this questionnaire covered different dimensions and were designed to obtain different information. Some of the questions focused on evaluating students' positive interest; others were used to evaluate negative interest. In addition, there are other questions that focus on students' sports participation, folk dance interest, and independent inquiry skills, respectively. Overall, these questions were divided into two main categories: positive and negative scoring questions, which were evaluated based on a five-level scoring system. In addition, all sample respondents were divided into control and experimental groups, and an independent sample t-test was adopted to compare the students in each group on different dimensions.

Table 3 shows the final results of the survey. Before the beginning of the teaching practice, the p-values of the students in the experimental group and the control group on the five dimensions of interest in learning folk dance were 0.187, 0.832, 0.118, 0.175, and 0.182, respectively, and the results of the test showed that the p-values of all the scoring items exceeded the 0.05 level of significance. This means that before the teaching intervention, the two groups of students did not show statistically significant differences in the five dimensions (P>0.05), and based on these results, it is clear that the data meets the requirements of homogeneity, thus validating the reliability of this experiment.

Table 3. Interest score results of 2 groups in each dimension (before experiment).

Dimension	Group	N	M+SD	Mean difference	T	P
Negative interest	Experimental group	25	123.86±8.185	1.218	0.818	0.187
	Control group	25	124.18±1.161			
Positive interest	Experimental group	25	122.01±1.222	-1.886	-0.888	0.832
	Control group	25	122.12±1.811			
Independent exploration ability	Experimental group	25	98.10±9.163	-1.858	-0.816	0.118
	Control group	25	98.32±9.482			
Participation in sports	Experimental group	25	91.17±1.111	1.146	0.811	0.175
	Control group	25	91.62±2.810			
Attention to Ethnic Dance	Experimental group	25	88.22±9.183	1.162	0.236	0.182
	Control group	25	88.34±8.621			

3.3.2. Comparison of the Scores of Students' Interest in Learning Ethnic Arts in the Two Groups after Teaching Practice

In the course of the study it was necessary to analyze the effectiveness of the integration of the elements of the course's ideology and to clarify the differences between pre- and post-integration. In this regard, the following analyses were carried out: first, a paired-samples t-test was conducted to compare the changes in the scores of the two groups of students before and after the experiment in order to compare the self-changes of the students in each group on these five dimensions. Next, an independent samples t-test was conducted for the post-experiment to compare the differences in the scores of the two groups of students on each dimension. Through these statistical analyses, we can assess the significant differences in the teaching effects of the curriculum Civics integrated into the Augmented Reality-based Ethnic Art Teaching Course compared to the traditional teaching methods.

1) Comparison of positive interest scores between the two groups after the experiment

In the process of course implementation, it is often necessary to evaluate students' interest in learning, and positive interest is a widely used evaluation index, based on which it is possible to clarify the students' positive mood and whether they are actively involved in the learning of ethnic art courses. If the score is high, it means that students have a high degree of initiative and interest in participating in folk dance learning. The data for the survey was analyzed and summarized based on the results obtained. Figure 9 shows the active interest scores of the two groups after the experiment. The positive interest scores of the two groups after the integration of curriculum Civics were different, with the experimental group (155.24±6.10) being significantly higher relative to the control group (123.01±2.18). In the case of the experimental group, there is P=0.001<0.01, indicating a statistically significant change in their scores before and after the experiment. For the control group, there was P=0.278>0.05, indicating that there was no change in the change of scores before and after the experiment.

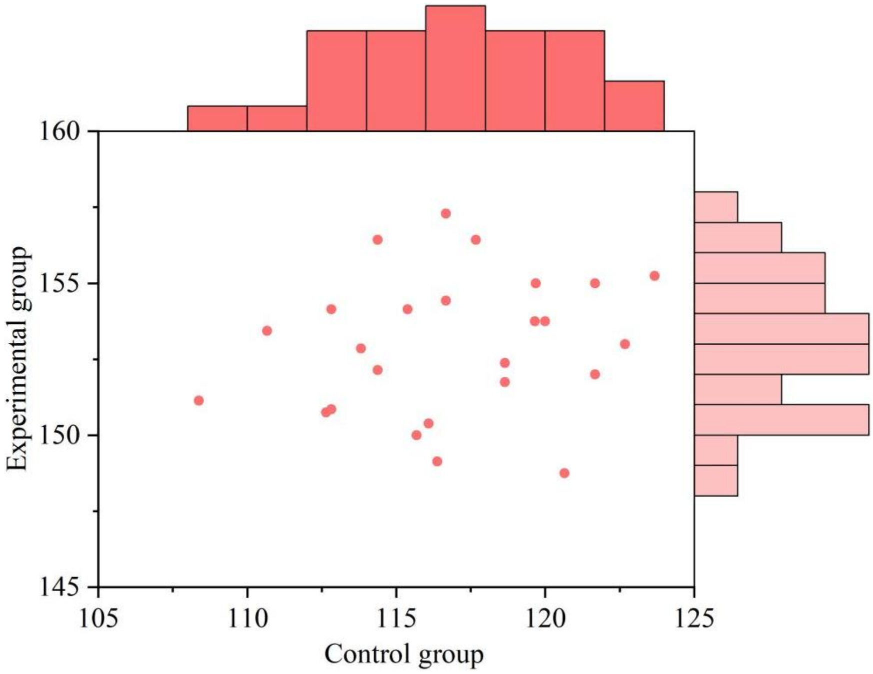


Figure 9. Scores of positive interest before and after 2groups of experiments.

2) Comparison of the scores of independent inquiry learning ability after the two groups' experiments

The ability of "independent inquiry" refers to the ability of students to reasonably explore the knowledge and skills related to folk dance through their own bodies under the guidance of teachers. If they have strong independent inquiry ability, it means that students have stronger subjective initiative, and they are more inclined to take the initiative to learn folk dance knowledge, which is very favorable to improve the effectiveness of classroom teaching. The questionnaire data were processed and analyzed in the research process, and Figure 10 shows the scores of independent inquiry learning ability of the two groups after the experiment. The independent inquiry ability of students in both groups increased after the experiment. The score of the experimental group after the experiment was 120.27 ± 4.02 and the score of the control group after the experiment was 100.15 ± 6.16. In this case, the score of the experimental group increased after the experiment ($p = 0.002 < 0.01$), i.e. there was a significant change before and after the experiment. However, there was no significant change in the score of the control group ($p = 0.271 > 0.05$), indicating that there was no significant change after the experiment relative to before the experiment.

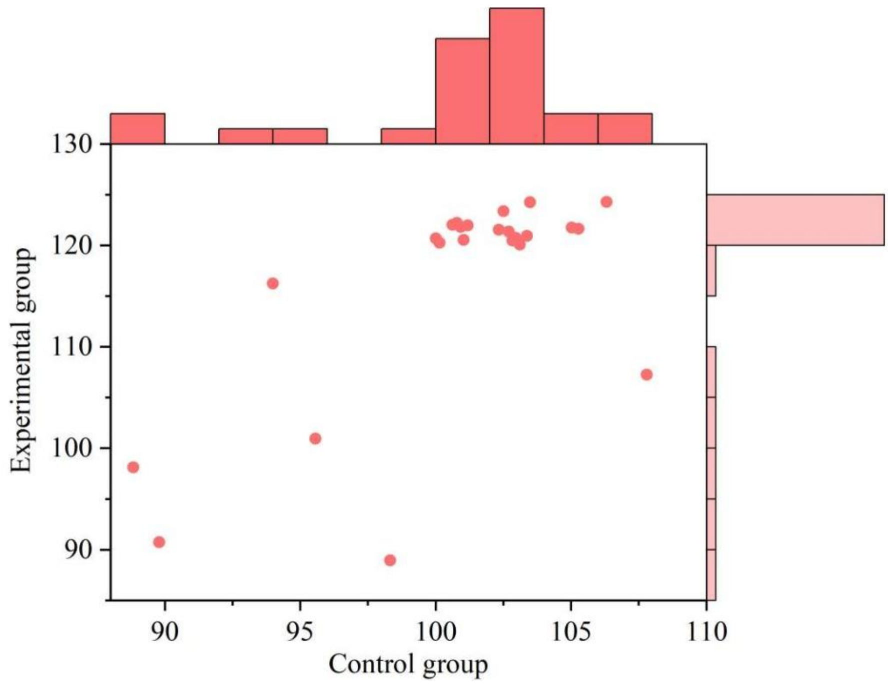


Figure 10. Comparison of scores for Autonomous Inquiry learning ability.

3) Comparison of motor participation scores between the two groups before and after the experiment

Through the "sports participation", we can assess the students' attitude towards the learning of ethnic art courses, and when the score of this index increases, it can be considered that the students show a positive attitude in the training of ethnic art skills and actively participate in the training activities. Here the questionnaire data are still processed and analyzed by SPSS software. Table 4 shows the specific analysis results. After the experiment the scores of both groups on this dimension maintained the trend of growth, the experimental group's score growth was 126.25 ± 0.273, while the control group's score growth was 95.47±3.823. There was a significant difference between the scores of the experimental group before and after the experiment ($p = 0.001 < 0.01$), while the control group did not have a significant difference ($p = 0.072 > 0.01$).

Table 4. Comparison of the sports participation scores of 2 groups of students.

Group	Before the experiment, M+SD	After the experiment, M+SD	Score difference	T	P
Experimental group	91.17±1.111	126.25±0.273	-35.08	-2.674	0.001
Control group	91.62±2.810	95.47±3.823	-3.85	-3.916	0.072

4. Conclusion

In this paper, we construct a national art teaching system integrating augmented reality technology, integrate it into the content of college courses on ideology and politics and test its teaching aid effect. In terms of technical performance, the tracking accuracy rate of the improved optical flow tracking algorithm reaches 0.970, and the success rate reaches 0.993, which are both more than 0.9. In the system fluency test, only 2 groups of tasks have recognition errors. In the learning effect test, the average score of the 50 tested students is more than 10 points. The system performance meets the learning needs. Students in the experimental group were significantly higher than the control group in the dimensions of active interest, independent inquiry learning ability, and sports participation score (P<0.01). In the future, we can deepen the combination of the elements of Civics and different ethnic art forms, and improve students' cognitive level of Civics in the process of ethnic art learning.

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