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Intervention of Art Education on College Students' Aesthetic Mood Based on Emotion Recognition Algorithm

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Abstract: *In today's era of highly developed spiritual civilization, art education has been paid more and more attention. In order to popularize art knowledge and cultivate college students' aesthetic literacy and other tasks, major colleges and universities have set up art appreciation courses. The art appreciation course is set up for college students, the purpose is to develop the aesthetic quality of college students, so that they can acquire critical thinking and enrich aesthetic experience. However, at present, the art appreciation class still has defects in both theoretical research and practice, which does not conform to the important concept of cultivating high-quality talents as the core advocated by higher art education. For a long time, teachers, teaching administrators and researchers lacked due attention and discussion on the teaching of art education. Therefore, based on the convolutional neural network, this paper integrated the emotion recognition algorithm into the art education teaching, and sorted out the main points of art education's aesthetic intervention for college students. The test results showed that under the art teaching based on emotion recognition algorithm, about 8.04% of students' aesthetic ability has been effectively improved. The cultivation of college students' aesthetic ability would help to promote the all-round development of college students and had a positive effect on promoting quality education.*

Keywords: *Education of Art, Aesthetic Intervention, Emotion Recognition Algorithms, Convolutional Neural Network*

1. Introduction

Art appreciation education is equivalent to emotional education. A person who lacks art appreciation education would also be in a state of chaos, so art courses play an extremely important role in cultivating college students' aesthetic literacy. Through the investigation of students, this paper explored the needs of students for art appreciation, and developed and integrated practical and effective teaching strategies.

Now there are some studies on art education by scholars. Liu R first expounded the current situation and development of modern art education in the digital information age, and pointed out the shortcomings of current art education. Then, a new interactive data teaching method is proposed, which is analyzed from three aspects: the reasons for the new interactive data teaching design, the curriculum design and the innovation of the curriculum design. Finally, from the perspective of practical teaching cooperation with enterprises, a scientific innovation education strategy was proposed [1]. Raymond advocated that the public should understand the value of art education [2]. Jeong-Ae examined the significance of pursuing difference and diversity in postmodern thought centered on art culture. To this end he explored the historical and cyclical definitions of art culture and its concepts in order to relate them to the purpose and pedagogy of education and art education [3]. Martynyshyn Y studied the functioning of the organizational and economic mechanisms of the governing bodies of arts higher education institutions and further develops alternative governance solutions for their successful implementation [4]. Dede B's research believed that the diffusion of information brings about the complexity of the industry, and the concept of division of labor emerged as the times require. Since art education cannot adapt to changing social needs, the field of art education has undergone long-term and fundamental reforms [5]. Lee M J believed that there are defects in the aesthetic method of art education for defining artistic values, mainly in the problems of goal establishment and realization [6]. Lavrinets A shed light on the practical orientation of teaching and the type of teaching practice organization in the arts disciplines. He determined the development prospects of curriculum training

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and the main direction of solving modern problems in art graduate education [7]. The above research analyzed art education.

Many scholars have conducted research on emotion recognition algorithms: Yu G had studied face recognition and emotion recognition algorithms to monitor the emotions of preschool children. The research used deep learning methods to design a more lightweight network structure to reduce the number of parameters and save computing resources. It not only has application innovations, but also algorithm enhancements [8]. Tang C used signals to model three emotions (happy, sad, and neutral) and compared five methods used by different teams in the study. The results showed that classical machine learning methods and deep learning methods perform similarly [9]. Nakisa developed an evolutionary computational algorithm for EEG-based feature selection for emotion recognition using mobile sensors [10]. Gabriels K described how virtual chatbots such as "artificial therapists" pose considerable challenges to emotion recognition algorithms [11]. Kyeong proposed a novel facial expression recognition method that can well recognize emotions from image sequences. First, many classifiers are constructed using different and multiple feature representations. Next, multiple classifiers are used to generate recognition results for each face image in the face sequence, resulting in multiple outputs. Finally, the emotion category of the face sequence is decided by using a weighted combination [12]. Gunawan TS selected linear predictive coding coefficients and Mel frequency cepstral coefficients to construct a speech emotion database [13]. Nakisa B proposed a new framework to automatically search for optimal subsets of EEG features using evolutionary algorithms. The proposed framework has been extensively evaluated on two public datasets and a new dataset acquired using mobile sensors. The results confirm that this algorithm can effectively support feature selection to identify the best features and best channels to maximize the performance on the four-quadrant sentiment classification problem [14]. Latha CP discussed some deep learning techniques that have paved the way to improve the classification accuracy of signals and speech signals [15]. The above scholars have made fruitful progress in the research of emotion recognition algorithm.

In the stage of higher education, art education is an important part of art education, and it is also an important way for schools to carry out aesthetic education. It has a status that cannot be replaced by other educational methods in the implementation of quality education. This paper studied the intervention of art education based on emotion recognition algorithm on college students' aesthetic mood. It provided certain reference ideas for college art teaching, and it points out the reform direction for future art teaching courses.

2. Construction of Art Education Based on Emotion Recognition Algorithm

(1) The current situation and development of art education

As a basic subject education, art education is the main way for schools to carry out aesthetic education [16]. The essence of art education is aesthetic education, which is an education that focuses on enhancing college students' aesthetic ability and cultivating their creativity. It has the role of serving political, moral and ideal education. The goals of art teaching are shown in Figure 1:

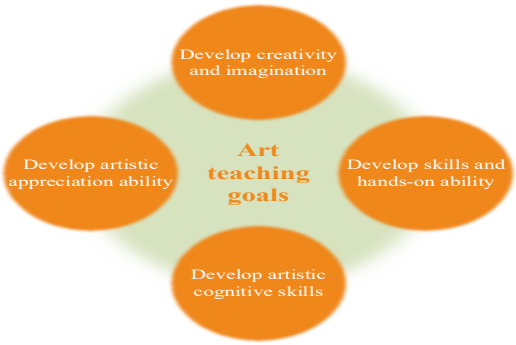

Figure 1: Art teaching goals

As shown in Figure 1, art teaching has four goals, which are to cultivate creativity and imagination, cultivate skills and practical ability, cultivate art cognitive ability and cultivate art appreciation ability. In the final analysis, it is to cultivate aesthetic ability. Although many college students have realized the importance of aesthetic literacy, they do not fully understand the basic theoretical knowledge of aesthetics. For natural ecology, human society, literature and art and many other fields, there is a lack of

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sufficient aesthetic awareness. The lack of theoretical knowledge would largely hinder the improvement of college students' aesthetic literacy. At the same time, it would also result in their weak aesthetic ability, and then unable to accurately control the aesthetic objects based on their senses and thinking, and even more unable to achieve a leap in understanding.

Contemporary college students have a certain correct understanding of aesthetics, and they pay attention to external beauty and are deeply aware of the value and role of internal beauty [17]. Most students are reluctant to put this concept into practical action, and cannot make a correct judgment on aesthetic value, and there is a phenomenon that there is a large distance between actual behavior and concept. College students clearly know the meaning of truth, goodness, and beauty, and at the same time express their rejection and disgust at the appearance of ugliness. It can be said that in the choice of personal behavior, there are still many negative situations, and the correct aesthetic concept cannot be regarded as an effective guide for one's own aesthetic behavior.

(2) Analysis of College Students' Aesthetic Intervention

Aesthetic quality is an important part of the all-round development of talents to be cultivated in quality education, and the improvement of aesthetic ability has laid a solid foundation for the cultivation of art professionals. The ability of college students to appreciate beauty and create beauty is also of great value in creating a campus artistic and cultural atmosphere and beautifying the campus environment. Aesthetics is a category that arises from the aesthetic relationship between human beings and reality, and takes art as the main object to study the category of beauty. Aesthetics belongs to the category of philosophy, and it takes art as its main research object, but it does not study the specific expression of art, but only its philosophy. The most fundamental problem of aesthetics is the relationship between the essence of beauty and aesthetic consciousness and aesthetic objects. Aesthetics is the science of the aesthetic relationship between human beings and reality, which is different from general art and not purely everyday beautification activities. Aesthetics is one of human's spiritual activities. It is a process of enriching and complex psychological feelings for the active subjects, and at the same time, it is also a process of obtaining their own meaning through the psychological feelings of these subjects. The situation of art education's aesthetic intervention on college students is shown in Figure 2:

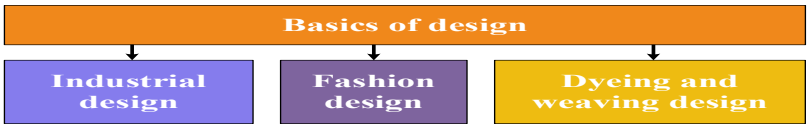

Figure 2: The intervention of art education on college students' aesthetics

It can be seen from Figure 2 that the aesthetic intervention for college students is mainly reflected in the level of art courses offered, which are mainly divided into industrial design, clothing design, and dyeing and weaving design.

College art education is the basic knowledge of art necessary to cultivate the aesthetic ability of college students. College students can develop their aesthetic ability only by mastering the basic theoretical knowledge of art. Art education courses and art education activities (mainly art courses) provide conditions for mastering the basic theoretical knowledge of art activities. Through the teacher's teaching, let the college students understand the basic knowledge of art, such as what is art, the meaning of art, the history of development, development trends, and various views and truths about art, etc. In the teaching courses, college students appreciate and understand natural beauty and art works by arranging appreciation classes and extracurricular activities.

Art education is conducive to the formation of correct aesthetic concepts for college students [18]. Aesthetic concept is the process of psychological activities in which aesthetic subjects generate emotion, experience, judgment and re-creation for aesthetic objects. It is the essential understanding of beauty gradually formed by people in the process of social practice. A painting, a sculpture, and a handicraft have an aesthetic image, which can make college students have a sense of beauty, so as to obtain spiritual liberation and free development. In the whole process of feeling beauty and appreciating beauty, forming one's own aesthetic point of view would help to improve the aesthetic ability of college students.

Fine art belongs to visual art, which can directly serve the viewer's visual experience and aesthetic psychology. In art education courses, teachers guide students through art education theory or art appreciation class. Through art education activities, students can not only feel beauty, appreciate beauty, but also show beauty by participating in art education practice activities, and enhance their perception

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of beauty in practice activities. For the cultivation of artistic creativity, college students must have a good aesthetic perception ability in addition to a certain artistic theory accomplishment. Based on the research on the intervention of art education based on emotion recognition algorithm on the aesthetic mood of college students, this paper analyzes the positive impact of art education in cultivating college students' aesthetic ability. Its main manifestation is that it provides the necessary knowledge base for cultivating college students' aesthetic ability, and prompts them to form a correct aesthetic concept.

(3) Convolutional Neural Network Foundation

Convolutional neural network belongs to artificial intelligence, and this paper uses it in the research of art education based on emotion recognition algorithm [19]. The concept of convolutional neural network technology is inspired by the human central nervous system. In terms of convolutional neural network technology, purely artificial nodes are called neuron points. The convolutional neural network structure is shown in Figure 3:

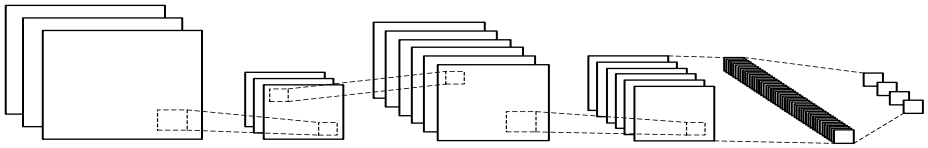

Figure 3: Convolutional neural network architecture

It can be seen from Figure 3 that convolutional neurons are connected to each other to form links and finally establish a topological lattice similar to the biological neural network [20]. In practical applications, because the convolutional neural network technology is developing towards diversification, there is still no unified official definition to call it. Convolutional neural network technology is similar to biological neural networks. Because it centrally computes parts of the function in parallel without describing the specific tasks of each device. In modern software development of convolutional neural network technology, biologically inspired approaches have been largely abandoned in favor of more practical approaches based on statistics and signal processing. In some software systems, convolutional neural network technology or a branch is part of a larger system. These systems combine adaptive and non-adaptive elements, and they have some things in common: nonlinearity, decentralization, parallelization, and local computation.

(4) Emotion recognition algorithm to improve art teaching

The art teaching model designed in this paper is divided into two levels, namely the emotion recognition level and the hardware system level.

At the emotion recognition level, emotion is a component of advanced intelligence. It is of great significance to the information communication between people, and emotion has become a key technology in the application of human-computer interaction in the process of realizing natural and humanized human-computer interaction. The purpose of emotion recognition is to use computers to collect, analyze and identify people's emotions in order to explore psychological activities or emotional changes. This paper uses emotion recognition algorithm to evaluate students' learning performance and state in the classroom.

In the hardware system level, it is divided into two modules: camera system and evaluation system. The camera system carries the functions of collecting, processing and managing image resources. The evaluation system is mainly responsible for evaluating the data generated by the emotion recognition algorithm, and using powerful computing power to evaluate the students' classroom learning status recognition and learning results. The teaching mode architecture of emotion recognition algorithm to improve art education is shown in Figure 4:

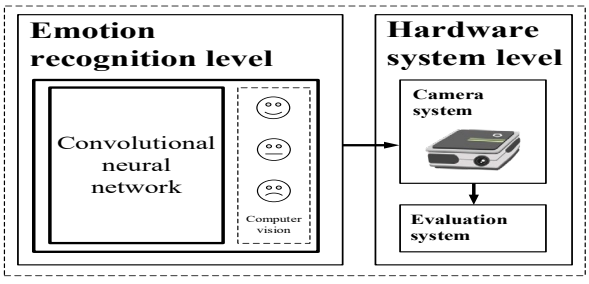

Figure 4: Teaching mode architecture

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As can be seen from Figure 4, the neural network algorithm to construct the learning evaluation system is mainly realized by face recognition. The details of the features designed in this article are described below. The main idea of facial recognition methods is to use prior knowledge of the structure of the human face. Expressions are described and discriminated by geometric shapes and feature points of the shape, size and relative position of salient features (such as eyes, nose, mouth, chin) that make up the shape and structural relationship of face parts. It then discriminates expression changes by tracking the location, shape, size, and distance and mutual proportions of these feature points.

In the art teaching classroom based on emotion recognition algorithm, teachers can detect the emotional state of students in real time to adjust teaching strategies, mobilize students' emotions, and improve the quality of teaching.

3. Emotion Recognition Algorithms

(1) Local phase quantization

Local phase quantization is designed to improve the robustness of texture operators, which can handle local textures of blurred images in two-dimensional space. The calculation Formula is shown in Formula (1):

$$F(u,x)=\sum_{y\in N_x} f(x-y)e^{-j2\pi u^T y}=w_u^T f_x \tag{1}$$

At this point, each pixel in the image can be represented by a vector, as shown in Formula (2):

$$F_x=\left[\mathrm{Re}\{F_x^c\},\mathrm{Im}\{F_x^c\}\right]^{\mathrm{T}} \tag{2}$$

It can be quantized, as shown in Formula (3):

$$q_j=\begin{cases}1, & if \quad f_j\geq 0\\ 0, & other\end{cases} \tag{3}$$

f_j is the j th component.

The encoding method is shown in Formula (4):

$$f_{LPQ}(x)=\sum_{j=1}^{8} q_j 2^{j-1} \tag{4}$$

(2) Local phase quantization of three orthogonal planes

Assuming that an image sequence is given, in order to calculate the histogram distribution of the image sequence, the histogram is defined according to the Formula, and the Formula (5) can be solved:

$$H_{i,j}=\sum_{x,y,t} I(f(x,y,t)=i), i=0,1,...,255, j=0,1,2 \tag{5}$$

The histogram must be normalized to obtain a consistent description, and the normalization operation is shown in Formula (6):

$$N_{i,j}=\frac{H_{i,j}}{\sum_{k=0}^{255} H_{k,j}} \tag{6}$$

Among them, $H_{i,j}$ is the histogram, and $N_{i,j}$ is the center code.

(3) Support vector machine

In the feature space, the separating hyperplane is described, as shown in Formula (7):

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$$\omega^T x+b=0 \tag{7}$$

The classification interval is defined as the sum of the distances from the support vectors of two different classes to the separating hyperplane, as shown in Formula (8):

$$\left\{\begin{array}{l}\omega^T x_i+b\geq+1,\ \mathrm{y}_i=+1\\ \omega^T x_i+b\leq-1,\ \mathrm{y}_i=-1\end{array}\right\} \tag{8}$$

The basic type of support vector machine is further obtained, as shown in Formula (9):

$$\left\{\begin{array}{l}\min\limits_{\omega,b}\dfrac{1}{2}\|\omega\|\\ s.t.\quad y_i\left(\omega^T x_i+b\geq 1,\quad i=1,2,...,m^2\right)\end{array}\right. \tag{9}$$

(4) Neuron model

The neuron model needs to have an external bias, its role is to increase or decrease the network input of the activation function accordingly, if it is increased, it is set to a positive value, and vice versa. The neuron model can be expressed by the formulas:

$$u_k=\sum_{j=1}^{m}w_{kj}\,x_j \tag{10}$$

$$y_k=\varphi\left(u_k+b_k\right) \tag{11}$$

Among them, u_k is the output of the linear combination of the input signal, b_k is the bias; y_k is the neuron output signal.

A modified linear unit can be used as the activation function, which is very similar to the linear unit and therefore has the characteristics of easy optimization. It is precisely because of this feature that it is often used as the activation function of neural networks after being introduced. The modified linear unit is shown in Formula (12):

$$g(z)=\max\{0,z\} \tag{12}$$

The maximum criterion is shown in Formula (13):

$$\mathrm{E}=\max\left(p_{ij}(x)\right) \tag{13}$$

The average criterion is shown in Formula (14):

$$\mathrm{E}=\max\left(\frac{1}{n}\sum_{j=1}^{m}p_{ij}(x)\right) \tag{14}$$

The weight criterion is shown in Formula (15):

$$\mathrm{E}=\max\left(\sum_{i=1}^{m}w_i\times p_{ij}(x)\right) \tag{15}$$

Among them, E is the category of the expression, and p_{ij} is the posterior probability output by the classifier.

The product criterion is shown in Formula (16):

$$\mathrm{E}=\max\left(\prod_i p_{ij}(x)\right) \tag{16}$$

The gradient magnitude is shown in Formula (17):

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$$G(x,y)=\sqrt{G_x(x,y)^2+G_y(x,y)^2} \tag{17}$$

The direction is shown in Formula (18):

$$a(x,y)=\tan\frac{G_y(x,y)}{G_x(x,y)} \tag{18}$$

Renormalizing to get Formula (19):

$$f=\frac{v}{\sqrt{\|v\|_k^2+e^2}} \tag{19}$$

Among them, $\|v\|_k$ represents the k order norm of V.

4. Art Teaching Experiment Based on Emotion Recognition Algorithm

In this paper, the questionnaire survey after the actual teaching is carried out to obtain the data related to the quality of art teaching based on the emotion recognition algorithm. In this paper, the art teaching mode based on emotion recognition algorithm is named A1, and the traditional art teaching mode is named A2. A total of 20 students from different majors in a university were selected, and 10 courses were conducted in the two modes respectively. The total course time was 400 minutes to compare the teaching quality.

The student information is shown in Table 1:

Table 1: Student information

Student	Specialized	Age
A	Philosophy	19
B	Philosophy	20
C	Economics	19
D	Economics	20
E	Economics	21
F	Law	21
G	Literature	19
H	Literature	21
I	Science	20
J	Science	21
K	Engineering	19
L	Engineering	20
M	Engineering	21
N	Art	19
O	Art	19
P	Art	19
Q	Art	20
R	Art	20
S	Art	21
T	Art	21

It can be seen from Table 1 that the majors of the students mainly cover philosophy, economics, law, literature, science, engineering and art, and the age ranges from 19 to 21.

(1) The duration of the student's active state

Positive emotions can drive college students to monitor their own learning and maintain their learning behavior. From the perspective of cognitive strategies, positive emotions can enable college students to better retain learning information in their memory, so that the original knowledge and new knowledge can be linked. It promotes the generation of new knowledge, and the positive state is mainly identified by the emotion recognition algorithm. The active state duration of 20 students under the two

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teaching modes is shown in Figure 5.

Figure 5 reflects the duration of students' active state under the two teaching modes. The art teaching mode based on emotion recognition algorithm designed in this paper is used for teaching. Compared with the traditional art teaching, the students' active state is longer, it can be concluded that the students' learning enthusiasm in the art teaching class based on emotion recognition algorithm is far better than the traditional art teaching class.

(2) The duration of the student's negative state

Negative emotions make college students have low learning mood, suppress their activity ability and cause them to be unresponsive and inefficient. Negative emotions can weaken people's aesthetic ability, and they are prone to fatigue, lack of energy and lack of interest in aesthetic activities. Negative emotions can reduce the level of human intelligence. The duration of the student's negative state is shown in Figure 6.

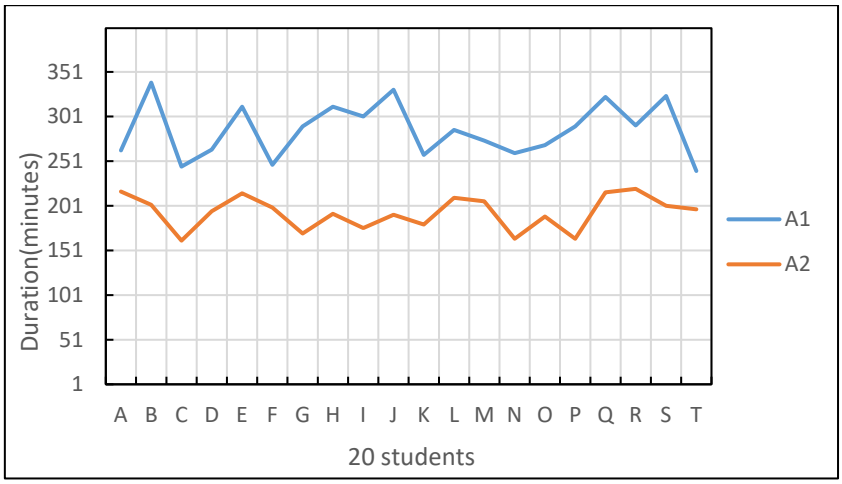

Figure 5: Active state duration

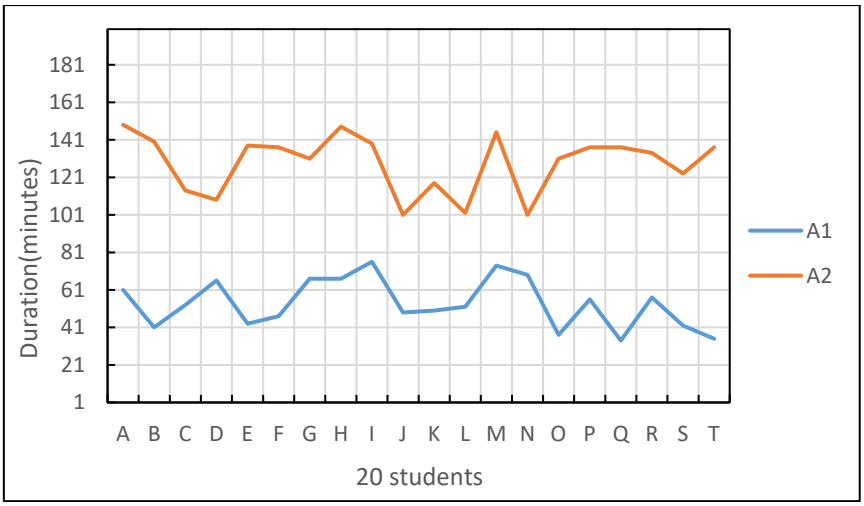

Figure 6: Proportion of students in negative state

Figure 6 reflects the duration of students' passive state under the two teaching modes. The art teaching mode based on emotion recognition algorithm designed in this paper is used for teaching. Compared with traditional art teaching, the duration of students' negative state is shorter, and it can be concluded that students' learning enthusiasm in art teaching classroom based on emotion recognition algorithm is far better than traditional art teaching classroom.

(3) The rate of students rising in class

Today, with the intelligentization of mobile phones and the rapid development of the mobile Internet, the mobile Internet has quietly "invaded" university classrooms. There is an endless stream of students swiping the screen of their mobile phones, bowing their heads and indulging in the colorful

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online world. However, very few students really look up in class and listen to the class. Often, the teacher sings a one-man show in class alone. The rate of students raising their heads in class is shown in Figure 7.

Figure 7 reflects the students' class head-up rate under the two teaching modes. The art teaching mode based on emotion recognition algorithm designed in this paper is used for teaching. Compared with traditional art teaching, the time for students to raise their heads is longer. It can be concluded that students' learning enthusiasm in the art teaching class based on emotion recognition algorithm is far better than that in the traditional art teaching class.

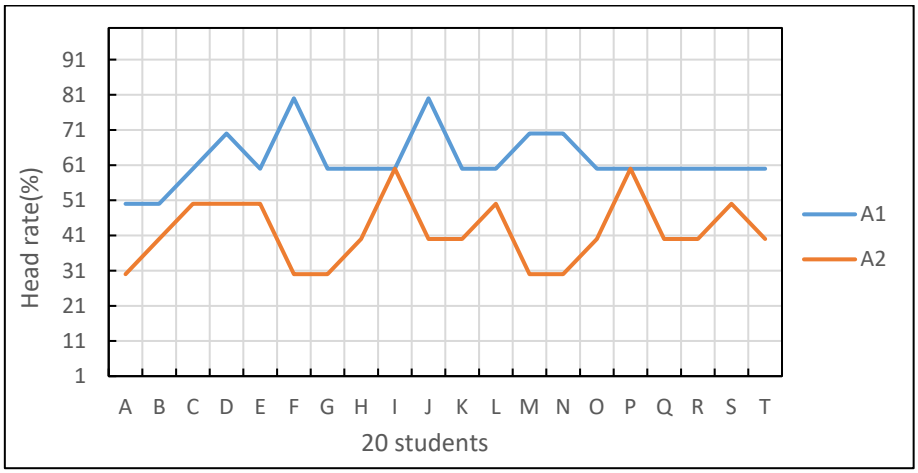

Figure 7: Student class head-up rate

(4) Score of students' aesthetic ability

In the art classroom, students' emotions affect their learning status to a certain extent, and then affect their aesthetic ability. The aesthetic ability under positive emotions is often effective. The students' aesthetic ability scores are shown in Figure 8:

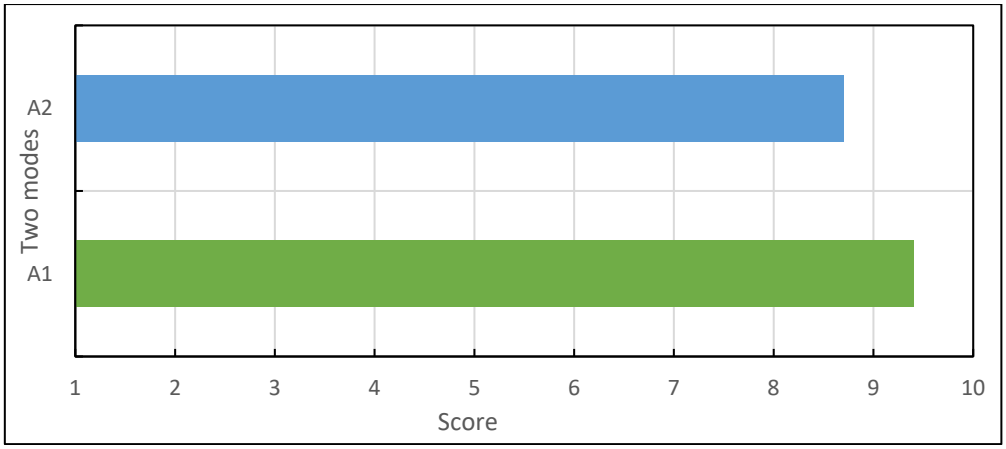

Figure 8: Students' aesthetic ability score

Figure 8 reflects the aesthetic ability under the two teaching modes. Under the art teaching based on emotion recognition algorithm, the students' learning aesthetic ability performance is far better than the traditional art teaching classroom. It has effectively improved students' aesthetic ability by about 8.04%, which is conducive to improving students' artistic literacy.

5. Conclusion

The cultivation of college students' artistic creativity must not only have a certain artistic theoretical accomplishment, but also must have the practical activities of art education with substantial content, better aesthetic perception ability and aesthetic experience and so on. The experiment obtained the results of the duration of students' positive state, the duration of students' negative state, the results of students' class head-up rate and the results of students' aesthetic ability scores. The experimental results

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show that students learn art in the art teaching mode based on emotion recognition algorithm, which effectively improves their aesthetic ability and is conducive to the better development of art education. Through the art teaching model based on emotion recognition algorithm designed in this paper, the quality of college students in terms of feeling beauty, appreciating beauty, expressing beauty and creating beauty has been improved. It undoubtedly further promotes the improvement of the overall aesthetic ability of college students, and also effectively promotes the all-round development of college students.

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