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Application Characteristics of Multimedia Assisted Instruction Technology in Art Teaching Based on Image Processing Technology

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Abstract As the rapid progress of science and technology, the combination of technology and art has brought great innovation to art creation. Multimedia art has become an important part of modern visual art. At the same time, advances in science, technology and culture have changed the concept and methods of education. The new curriculum standards promote students' innovation and life skills, and encourage multimedia integration into art courses. In order to improve students' digital media literacy and better meet the social development of the 21st century, art teaching has actively updated its educational philosophy and gradually added courses in photography, computer drawing and design, and personalized animation. Adding 3D printing and other teaching contents to the school art classes and integrating multimedia technology into the art classes would help enhance students' aesthetic ability and promote the progress of art education in colleges and universities. In the process of development and improvement of multimedia teaching mode, how to control the quality of online teaching for students and teachers is also an essential topic of academic research in advanced education. This paper used image processing technology to study the application of multimedia assisted instruction technology in art teaching. This paper first introduced the application of image processing technology in teaching, including face recognition sign in, student behavior monitoring in class, etc. Then, this paper studied the use of multi-media teaching technology applied in art teaching. The advantages of multimedia teaching technology in art teaching were discussed, and suggestions were made on the methods of applying multimedia teaching technology in art teaching. The experiment part studied the effect of multimedia teaching technology. The research results showed that multimedia teaching technology can greatly improve the classroom content and classroom effect of art teaching, enhance students' interest in art learning, and greatly improve students' comprehensive quality and art ability. The students who use multimedia teaching technology have an art ability of more than 85 points, which is far higher than the students who use traditional teaching, indicating that multimedia teaching technology can be well applied to art teaching.

Index Terms Multimedia Assisted Instruction, Art Teaching, Image Processing Technology, Electronic Imaging

I. Introduction

At present, in most parts of the country, teachers' language teaching and demonstration as well as students' simulation teaching are still the main methods for schools to teach art. To some extent, this teaching method can not meet the higher requirements of art teaching. Secondly, the application of new media technology in art education is relatively simple and limited. In addition, teachers themselves do not pay enough attention to and understand the new media art. This paper puts forward a solution to this situation and conducts a practical study.

There are many scholars studying art teaching. Li Yong studied the teaching reform of traditional Chinese painting for art majors in colleges and universities [1]. Leeson Loraine studied the emerging education in the field of social participation in art, and social practice is the focus of education [2]. Hakimova G studied the scientific and methodological basis of art teaching in primary schools [3]. Khamidovich Talipov Nozim studied the characteristics of art teaching of future art teachers [4]. Demirbatir Rasim Erol determined the status of students in the art education department in terms of burnout level, vitality and education satisfaction. The results showed that the vitality of music students was lower than that of art students. Gender has no significant effect on any score [5]. Potocnik Robert determined the interest and knowledge level of art teachers in art materials (in selected art works), which can help them realize how a specific fine art material is used in art classes [6]. Al-Yahyai Fakhriya discussed the importance of art museums for art education in Oman, which would play a role in filling the knowledge gap about the role of museums in art education in Oman [7]. Although there are many researches on art teaching, it is necessary to continue to reform the art teaching methods.

Multimedia technology has been used in the field of education. Nasrudin N developed multimedia based educational games for ninth grade students in junior middle schools, and investigated their impact on students' learning psychology when facing computer examinations [8]. Mayer Richard E reviewed 12 research-based principles on how to design computer-based multimedia teaching materials to promote academic learning [9]. Valijonovna Kholdarova Iroda studied the use of multimedia technology in preschool education system [10]. Malkoc Ummuhan used multimedia methods to assist chemical experiment teaching. Research showed that animation has slightly improved teachers' content knowledge [11]. Although multimedia teaching is widely used, there is a need to study the methods of applying multi-media technology to art teaching.

Traditional art teaching relies on paper books for teaching, and teachers only give oral explanations to the knowledge on books. The teaching course is boring, and students cannot directly feel the contents of the book. In order to increase the efficiency of the classroom of art teaching and enhance students' interest in art, this paper used image processing technology to study the multimedia assisted teaching in art teaching, put forward suggestions on the application of multimedia teaching in art teaching, and conducted experimental research.

II. Multimedia Technology and Image Processing

There is no standard definition of multimedia technology. For example, some people think that multimedia devices are composed of hardware devices and software devices, and the connection of various sensory experience means can form a sensory effect that makes people remember deeply. In visual media, image refers to graphics, animation and text representation in audio, stereo and music. Others define multimedia as a combination of traditional computer tools, such as interactive applications for text, graphics, images, logical analysis methods, video, audio and knowledge [12]. It is widely accepted that multimedia technologies can process information in various media and in various kinds of memories [13].

With the rapid development of multimedia technology since the 1990s, it has been applied in various fields of economic and social life, bringing great changes to production, work and even life. In particular, multimedia with the characteristics of images, texts, sounds and even mobile images can provide the best learning environment, which would have a profound impact on education and learning processes, traditional teaching methods and teaching content, and would lead to fundamental changes in the entire educational thinking, educational theory and even the educational system. Multimedia technology plays such an important role in education, because multimedia technology itself has many characteristics and functions that are particularly important in the process of education and learning. Compared with other media, these features are unique to multimedia technology [14].

When shooting an object, the light reflected on the object is collected by the camera lens to focus on the light receiving surface of the imaging device, and then the light is converted into electrical energy through the imaging device to obtain the "video signal". The photoelectric signal is very weak, which needs to be amplified by the pre amplifier circuit, and then processed and adjusted by various circuits in the camera. The final standard signal can be sent to the video recorder and other recording media for recording, or transmitted through the communication system or sent to the monitor for display.

When photographing an object, the light reflected by the object is collected by the camera lens, and then converted into electrical energy by the camera device to obtain a "video signal". The light signal is very weak and must be amplified by a preamplifier circuit, and then processed and adjusted by different camera circuits. After electronic imaging, the image can be processed. Computer image processing technology can modify image content through information and data correction module to meet the expectations of image users and improve the application of image processing technology. As a module of the development of face recognition technology, the application of computer image technology can improve the computing power of face recognition algorithms and improve the efficiency of face recognition technology in various fields. Face recognition is a biometric computer technology, which can provide information about face features. It combines computer vision technology and biometrics. The computer image processing technology is used to extract some features of the human body image, analyze the principle of biological features, and establish a mathematical model. It also stores it on the computer, and realizes the purpose of recognition. Face recognition has had a significant impact on people's work and daily life, especially the gradual improvement of cloud computing, massive data, Internet and other services, which has constantly promoted the development and improvement of face recognition technology.

III. Application of Image Processing Technology in Online Teaching

(1) Face recognition sign in

Online check-in plays an important role in school management. Online sign in and help modules enable online course instructors to immediately know if they have online students. According to the analysis results, most of the existing online check-in is only at the beginning of online learning. When students click the application button, they

do not need to identify faces. Teachers and others cannot confirm that students leave after registration. At the same time, when teachers are in the process of online teaching, they must monitor the behavior of each student in the online learning process, which is very difficult to achieve. Therefore, face recognition technology can be used to evaluate students' signing in and online learning after signing in. The face recognition sign in method is shown in Figure 1.

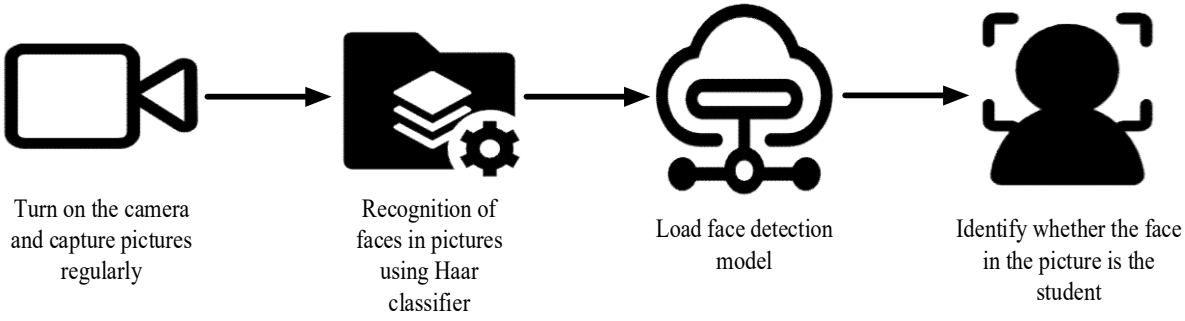

Figure 1: Sign in method for face recognition

First of all, students must turn on the camera equipment, and then borrow the camera equipment to get photos. Secondly, the position and features of the face in the image are determined to obtain a facial image. Finally, using the facial data collected in advance, students can obtain identity recognition through identity recognition algorithm. Photos are taken in real time every 30 milliseconds. If the test does not exist within the specified time period, the test would fail. With the help of facial recognition technology, students' identities can be effectively judged in the process of online learning.

(2) Students' classroom behavior monitoring

In the Internet learning, students would become addicted to entertainment, screen separation for a long time, distraction, blindness, etc. in the classroom. Therefore, relatively mature image processing technology can be used to intelligently monitor and evaluate students' online behavior in real time.

Because the students who leave the screen for a long time do not behave well, image processing technology can be used to measure the distance between the students and the computer screen. If it is found that the monitored person is excluded within the scheduled time, and if the student does not seriously participate, it is necessary to immediately send a message to the teacher to let the teacher pay attention to the situation of the student. When measuring the distance on the screen, similar triangles are used to calculate the distance between the object (face) and the camera (computer camera). The camera captures the object and measures its width in pixels. The focal length is calculated as follows:

$$F = \frac{P \times D}{W} \tag{1}$$

The average width of male is 143mm, and that of female is 136mm. The pixel width in the face area would change with the distance from the camera. The face screen distance is as follows:

$$D = \frac{F \times W}{P} \tag{2}$$

The distance detection method is shown in Figure 2.

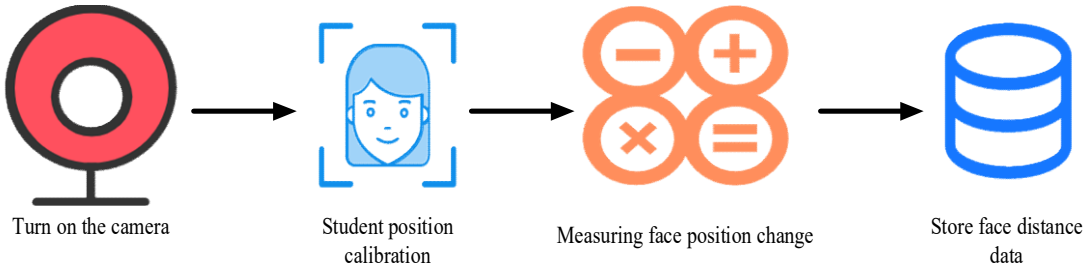

Figure 2: Distance detection method

IV. Application of Multimedia Teaching Technology in Art Teaching

Multimedia teaching refers to the reasonable selection and use of modern learning means according to learning objectives and subject characteristics, the organic combination with traditional learning methods, the participation in the learning process, the use of students' multimedia information to form a reasonable structure of the learning process, and the realization of the best efficiency of learning [15]. Multimedia teaching began in the 1980s. At first, many digital media were used in teaching, such as presentations, virtual images, audio, video and other embedded applications, as well as school courses. At present, multimedia teaching is usually understood as learning activities using multimedia computers and existing multimedia courses. Multimedia courses are designed according to learning objectives, which reflect the particularity of teaching content and certain teaching strategies [16].

(1) Advantages of multimedia teaching technology in art teaching

a) Multimedia skills enhance the effectiveness of art education and greatly increase students' motivation to learn. 85% of human information comes from visual observation, 10% from hearing, and the remaining 5% from smell, touch, and taste, indicating that people can see more information through visual and auditory stimuli, which is far more than the information obtained when only hearing. The use of multimedia teaching materials in art teaching enables teachers to display existing theoretical knowledge more intuitively. Multimedia teaching provides the interaction of images, sounds and dynamic images to stimulate students' different feelings and improve the teaching effect.

b) Multimedia software with different functions provides art teachers with different demonstration methods, greatly simplifying their work, such as video, physical projection, flash, etc. In the process of homework demonstration, teachers can also use smart phones to capture the just completed homework, connect to the computer, and use projectors to play homework to students. It is very effective to demonstrate clearly, vividly and quickly, which stimulates students' interest in learning. In addition, because appreciation plays an important role in art education, all versions of art materials, such as paintings, sketches, ink and wash paintings, reliefs, clay sculptures, etc., include a lot of content that needs appreciation. If there is no multimedia software, teachers can only orally degrade the appreciation content, and cannot specifically expand and explain the teaching materials. However, multimedia technology enables teachers to use different software to demonstrate and process images on the spot. Different processing of the same image can have different forms of expression, produce different image effects, and enable students to obtain different visual understanding and perception.

c) Multimedia can present a variety of teaching materials and enrich teaching content. Modern art education is the innovation and expansion tool of traditional education, providing a broader computer platform for art education. In the future, electronic textbooks and electronic reading materials would become the main body of art materials; image information would become the main content of teaching materials; auxiliary tools of art production would enrich teaching content. For example, Internet electronic encyclopedias, digital libraries and art education websites provide students with more intuitive and rich art resources and works to express their views and opinions. Through multimedia software, students can download materials from relevant websites, learn from each other and entertain each other. Students can also give public lectures on computers in the classroom. This course not only enables students to use their own hands and brains, but also enriches the public resources of art in the same direction. In general, multimedia technology has unique advantages in art education. It has reached a high level of art education, achieved informatization and diversification, and played a very important role in cultivating innovative and research talents.

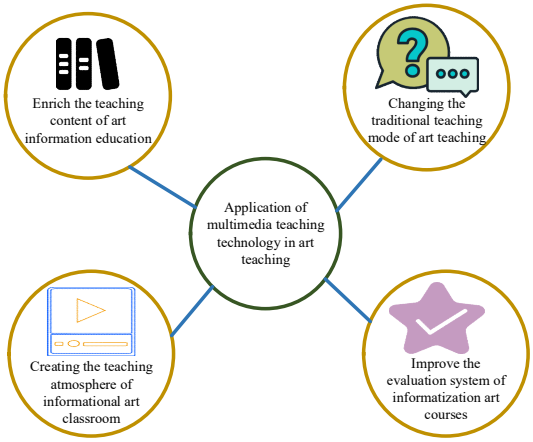

Figure 3: Application of multimedia teaching technology in art teaching

(2) Application of multimedia teaching technology in art teaching

The application method of multimedia teaching technology in art teaching is shown in Figure 3.

a) Combining the convenience of multimedia to enrich the teaching content of art information education

The previous art education overestimated the practice and working methods of art and ignored the necessity of theory. Due to the content limitation of art textbooks, the content of theoretical knowledge cannot be expanded. With the convenience of multimedia, people can access the database of the art network, and find all kinds of materials and information.

b) Creating information art education atmosphere with multimedia intuition

The curriculum is introduced as one of the key elements of teaching and learning. The materials gathered and summarized in the course stage, represented by computer multimedia, and enable students to enjoy works of art intuitively and carefully. The combination of multimedia music and art classes can stimulate students' interest in learning under the stimulation of vision, hearing and other senses. In the process of art information management, the use of multimedia can break the level of space.

c) Changing traditional art teaching with multimedia teaching materials

The traditional mode of art education is that teachers practice, demonstrate and observe students on the blackboard. This teaching mode is too rigid for art classes, and the actual teaching effect is not ideal. By using multimedia technology and video demonstration, teachers can strictly control the demonstration teaching time, teach more courses and improve teaching efficiency. On the other hand, it promotes the development of interactive teaching, expands the distance between art teachers and students, solves art education problems through classroom discussion, and meets the needs of all students in art education.

d) Using multimedia network platform to improve the grading system of information arts course

Multimedia is used to establish an art course evaluation system and an online platform for multimedia technology. It breaks the boundaries of time and space, enriches students' learning styles, and allows students to learn art through the network platform after class. This requires an appropriate course evaluation system to monitor and evaluate students' learning. The use of multimedia technology allows students to have access to objective and realistic information on the Internet, which allows them to evaluate students more comprehensively and effectively. In addition, the application of multimedia in art information teaching would help teachers sort out and analyze the situation in the process of multimedia art teaching according to the situation of the registered classroom, reflect on teaching, adapt to the teaching mode, and constantly optimize and improve the art curriculum design based on multimedia information.

V. Multimedia Assisted Art Teaching Experiment

The art teaching experiment was conducted in 6 classes of 3 schools, including 3 classes for multimedia assisted art teaching and 3 classes for traditional art teaching. The teaching experiment lasted for 1 month.

(1) Teaching content evaluation

The evaluation results of the six classes on the teaching content are shown in Figure 4.

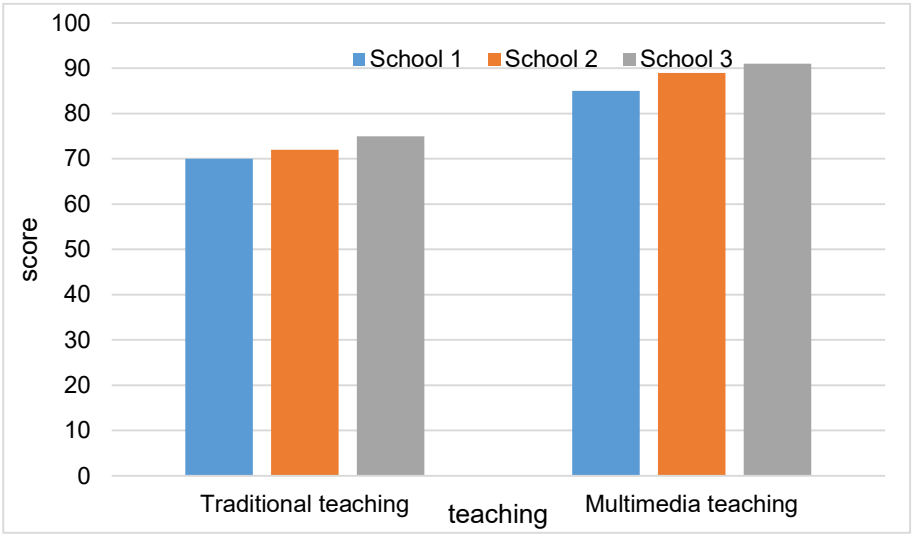

Figure 4: Teaching content evaluation results

For School 1, when using traditional teaching methods for teaching, the evaluation result of teaching content was 70, and when using multimedia to assist art teaching, the evaluation result of teaching content was 85. For School 2, when using traditional teaching methods for teaching, the evaluation result of teaching content was 72, and when using multimedia to assist art teaching, the evaluation result of teaching content was 89. For School 3, when using traditional teaching methods for teaching, the evaluation result of teaching content was 75, and when using multimedia to assist art teaching, the evaluation result of teaching content was 91. It can be seen that compared with traditional teaching methods, multimedia teaching can use digital resources to enrich teaching content.

(2) Classroom effect evaluation

The evaluation results of the six classes are shown in Figure 5.

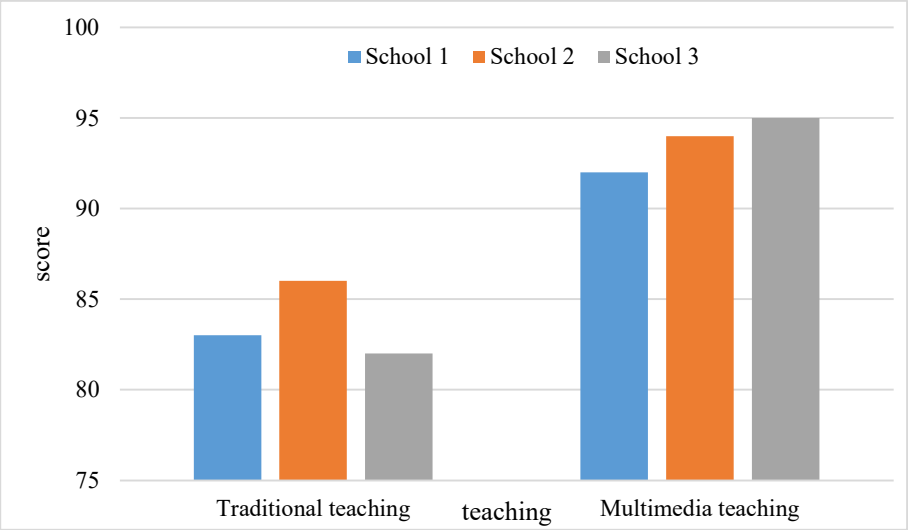

Figure 5: Classroom effect evaluation results

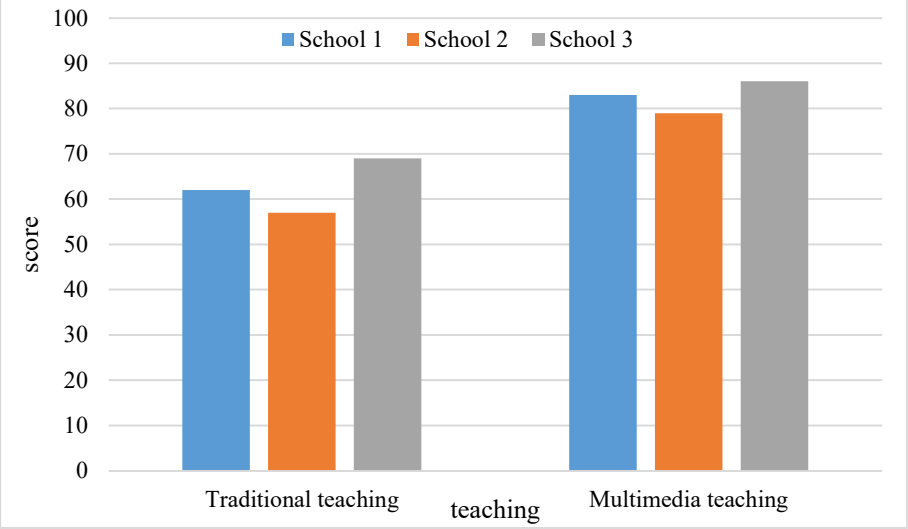

Figure 6: Students' interest in learning

For classroom effect evaluation, the result of classroom effect evaluation for the traditional teaching class in School 1 was 83; the result of classroom effect evaluation for the traditional teaching class in School 2 was 86; the result of classroom effect evaluation for the traditional teaching class in School 3 was 82. For the class that conducted multimedia assisted art teaching, the result of classroom effect evaluation of the class that conducted multimedia assisted art teaching in School 1 was 92; the result of classroom effect evaluation of the class that conducted multimedia assisted art teaching in School 2 was 94; the result of classroom effect evaluation of the class that conducted multimedia assisted art teaching in School 3 was 95. It can be seen from the comparative data that multimedia teaching can increase the vividness and intuitiveness of art teaching. Traditional art teaching can only

rely on books to explain, which is too abstract for students. After multimedia assisted teaching, multimedia materials such as animation and video enable students to have a more intuitive and vivid understanding of art through multimedia equipment, which enhanced the teaching effect of art classroom.

(3) Students' interest in learning

The survey results of students' learning interest in six classes are shown in Figure 6.

In School 1, the students who were engaged in traditional art teaching had an interest in art of 62 points, and the students who were engaged in multimedia assisted art teaching had an interest in art of 83 points. In School 2, the students who were engaged in traditional art teaching had an interest in art of 57 points, and the students who were engaged in multimedia assisted art teaching had an interest in art of 79 points. The students in School 3 who were engaged in traditional art teaching had an interest in art of 69 points, and the students who were engaged in multimedia assisted art teaching had an interest in art of 86 points. It can be seen from the data that multimedia assisted art teaching can greatly enhance students' interest in art. Various forms of teaching resources such as videos and pictures can attract students' attention, show boring content in vivid forms, and improve students' interest in art.

(4) Comprehensive quality of students

The survey results of students' comprehensive quality in 6 classes are shown in Figure 7.

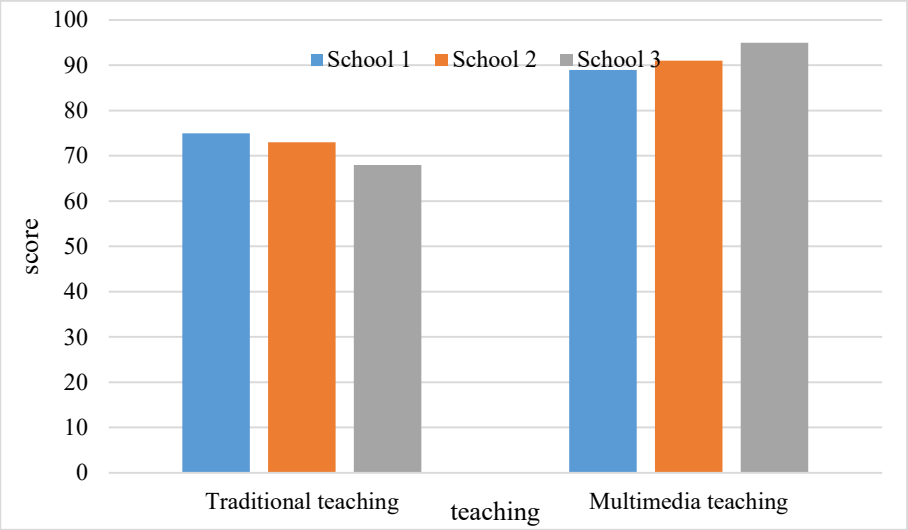

Figure 7: Comprehensive quality of students

It can be seen from the data that the comprehensive quality of the students in School 1 who were engaged in multimedia assisted art teaching was 14 points higher than that of the students who were engaged in traditional art teaching; in School 2, the comprehensive quality of students who were teaching multimedia assisted art was 18 points higher than that of students who were teaching traditional art; the comprehensive quality of the students in School 3 who were engaged in multimedia assisted art teaching was 27 points higher than that of the students who were engaged in traditional art teaching. Multimedia-assisted teaching can greatly improve the overall performance of students. It can also use vivid pictures and teaching methods to improve students' curiosity in the learning process, guide students to think, enhance students' self-confidence, thinking ability and creativity, and improve students' comprehensive quality.

(5) Students' art ability

The survey results of students' art ability in 6 classes are shown in Figure 8.

After the teaching experiment, the students would be tested for their artistic ability. For the traditional art teaching methods, the art ability of students in School 1 was 75 points; the art ability of students in School 2 was 79 points; the art ability of students in School 3 was 81 points. All were below 85 points. For the multimedia assisted art teaching method, the art ability of students in School 1 was 88 points; the art ability of students in School 2 was 92 points; the art ability of students in School 3 was 94 points. All of them were above 85 points, which showed that the multimedia assisted art teaching method can greatly improve students' art ability and was very applicable in art teaching.

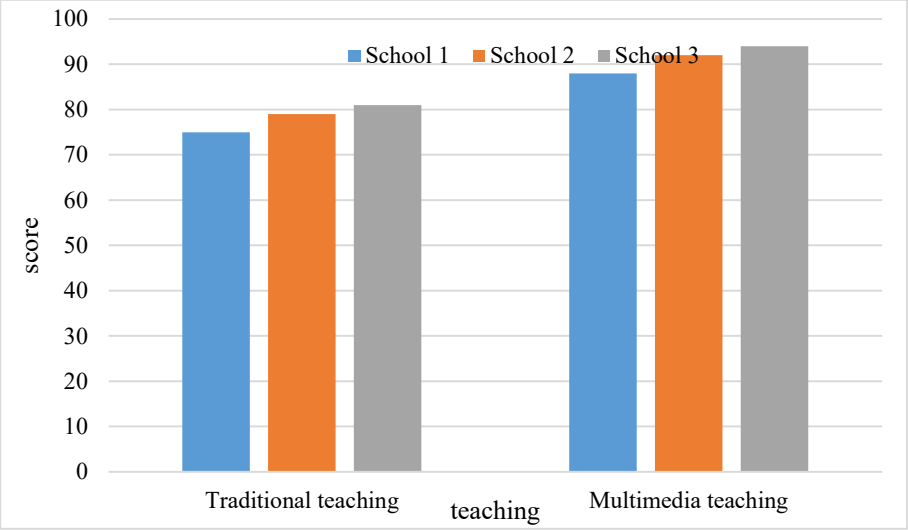

Figure 8: Students' art ability

VI. Conclusions

This paper used image processing technology to study multimedia assisted art teaching, introduced the principle of image processing technology and multimedia technology, and introduced its application in art teaching. It also put forward its own suggestions, and carried out experimental verification. Research showed that multimedia technology can provide a variety of teaching resources in the teaching process, and improve students' learning interest and learning ability. Image processing technology can monitor students' status in the classroom, so that teachers can better grasp students' learning situation.

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