# Research on the Application of Computer Big Data and Information Visualization Technology in Art Courses

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*Abstract*—The article uses computer as an auxiliary teaching method in art teaching, which can not only enrich the content of art teaching, but also provide guidance for students from theory and art creation. The article first analyses the advantages of auxiliary teaching from the application value of computer-aided technology, and then studies the design of auxiliary platform system. The focus is on the analysis of the system's database construction and web search service construction, and the system framework and system teaching process are also given. Finally, the system is applied to the practice of art teaching and has achieved certain results.

*Keywords—Art teaching, computer, big data technology, art online teaching system*

## I. INTRODUCTION

With the continuous development and wide application of modern computer technology, artificial intelligence, etc., it has brought great impacts and changes to the education and teaching methods, resulting in great changes in the methods and evaluation of curriculum teaching. As an important natural subject, art courses should be integrated with the times in the era of digital development. Through the construction of networked teaching and examination methods, the cultivation of students' art literacy can be achieved [1]. The "Full-time Compulsory Education Art Curriculum Standards" also clearly stated that the current art teaching work should make full use of different curriculum resources inside and outside the school, or use the natural environment to provide help for the teaching work. Therefore, how to comprehensively apply computer-assisted technology has become the main goal of subsequent teaching work. In this regard, this article combines IPAD smart devices to propose a mobile learning client to provide a reference for the study of art design courses.

## II. THE APPLICATION OF COMPUTER BIG DATA TECHNOLOGY IN ART COURSES

At present, college art teaching courses are slightly different according to the geographical distribution. The common reality of their teaching characteristics are example textbooks, educator teaching materials and professional practice examples. Although there are a few phenomena of using computer platforms to carry out art teaching, these phenomena are mainly Leaning towards electronic tutorials, model paintings and a small amount of courseware, and focusing on the drawing and storage of teaching materials, but has not paid attention to the development and realization of the construction and learning methods based on the computer network learning environment. It can be said that

the art teaching model centered on educators and one-way teaching is still the mainstream. The network model of the computer teaching platform can be fully utilized to carry out personalized training for learners, so that they can form an independent, research-oriented, professional learning model. The interactive type has not yet been truly realized, and the research on the teaching mode of computer digital big data technology is still in its infancy.

### A. The role of computers in learning aids

Generally speaking, the teaching environment of computer digital big data technology is more suitable for research learning. Computer digital big data technology has the characteristics of autonomy, interaction, inquiry, application and so on. At present, in the practical application of research learning based on computer digital big data technology teaching, the use of computers is only at the stage of searching and retrieving teaching materials. New features such as rapid transmission, instant interaction, resource sharing, and global synchronization of computer digital network technology have not been fully developed. Computer digital big data technology will provide support for research learning and provide sufficient theory for research based on computer-assisted art teaching And practical environment.

### B. Multimedia technology under computer big data

The research on computer digital big data technology, summarize the teaching theory and teaching methods of computer-assisted art, explain the basic functions and teaching methods of digital big data technology art education, and propose a modern art education form based on computer digital big data technology. Discuss the curriculum plan including the basics of art, creativity of art, composition of art, color of art, and art cases. By carrying out practical research on digital big data technology, using the modern art curriculum plan as a clue, analyzing the causes of the information transformation of art teaching activities, mastering the theoretical basis for the extension of digital network to art education, and developing the theory and practice of computer-assisted art teaching Useful attempts at two levels.

### C. The significance of computer big data in art education

Art education is an important art category opened by colleges and universities. The nature of art teaching advocates creation and innovation. It is an open teaching, which encourages the individual development of learners, and encourages independent learning and professional research. In this paper, from the perspective of contemporary information technology development, with art

education informatization research as an important practical content, the effect analysis of computer-assisted art teaching mode is carried out, and it is concluded that the new mode has the advantages of art resource sharing, digital software technology and network platform advantages. With respect to support, these three advantages constitute the network enhancement of the new model. This network-enhanced teaching model not only retains the traditional classroom teaching of art educators, but also greatly uses computer networks to enhance auxiliaryity, highly integrates art resources, digital software and digital big data technology, and greatly improves learners The effect of learning.

## III. ANALYSIS OF THE ADVANTAGES OF COMPUTER BIG DATA TECHNOLOGY IN THE STUDY OF FINE ARTS SUBJECTS

### A. Multimedia art teaching can improve teaching quality

It can have a beneficial effect on the perception, understanding, memory, and application of all aspects are formed by transmitting external information to the brain center through various sense organs. The functions of these sense organs are different. In learning, the better the coordination of the functions of students' eyes, ears and brain, and improve the efficiency of students' learning.

### B. Multimedia teaching courseware is easy to upgrade

It can be continuously improved and upgraded, new content can be added quickly, and the most advanced art ideas and design concepts can be accepted. This is incomparable to the traditional textbook-based education method. Promote the popularization of fine arts on a larger scale. With the development of science, the number of families with computers is increasing, creating good material conditions for art education using multimedia computer technology as a teaching method.

## IV. APPLICATION OF COMPUTER BIG DATA TECHNOLOGY IN ART TEACHING

Teachers or students visit art sites on the Internet to tap the teaching potential of appreciation courses. Especially the numerous virtual art museums on the Internet, it uses digital virtual reality technology to simulate an existing or brand new art museum in full three-dimensionality. Such as the virtual Louvre, the virtual National Gallery, can make visitors feel as if they are on the scene.

### A. Intuitive teaching application

Of course, we are not saying that traditional teaching methods are backward or outdated. To a certain extent, the essence of "assisted teaching" is improving teaching efficiency. Compared with other subjects, art teaching pays more attention to intuition and visualization. In art class, the teacher's presentation is often out of touch with the analysis of abstract theory. Some can tell by words (explain) but hard to understand, while others are hard to tell (explain) sometimes. For example, in the teaching of color sketching, the explanation of the three elements, the color mixing experiment, the relationship between cold and warm colors and the environment, the difference between paint color and light color, etc., it will be more convenient and easy to explain in Photoshop software with computer-assisted teaching. Especially the adjustment of light and color and the explanation of its characteristics, it is almost impossible to teach without computer assistance. Due to the limitation of teaching conditions, this part of the content has been mentioned or abandoned in the past.

### B. Indirect painting perspective painting application.

It is not easy for art beginners to understand the perspective phenomenon in real space. Students are unable to deeply understand and apply flexibly and accurately to perspective phenomena such as parallel, angled, and oblique. Because the real space does not allow us to zoom at will, even if it is difficult to find a vanishing point of perspective, it is very difficult for the teacher to correspond the theoretical explanation to the phenomenon in reality, and it often requires more teaching hours for students to be able to. Comprehend. If computer-assisted perspective teaching is used, this problem can be easily solved. With the help of computers and three-dimensional modeling software, a vast virtual three-dimensional space can be displayed. We can zoom and stretch this virtual three-dimensional space arbitrarily, can reproduce the train going away from us, and make the distant railroad track disappear at a point. We can "expand" the house infinitely far away, until it disappears at a point, and the problem of the disappearing point is solved. We can also adjust the elevation angle of the house arbitrarily in the virtual three-dimensional space, and then we can intuitively verify the phenomenon and the relationship between the horizon line, the angled perspective, and the oblique perspective.

### C. Application of art pattern composition under computer big data

Pattern composition can be said that the importance of computer-assisted teaching in pattern composition is second only to art history and appreciation classes. We do not teach students to use computer production instead of hand-painted pattern composition training, but use graphic image software to design pattern composition The advantages of the Chinese, make the teaching content of pattern composition more substantial and rich. And further enlighten students' creative thinking. There is no doubt that the pattern composition course has great flexibility, but the demand for clean and meticulous homework makes the amount of labor in the course homework process astonishing. Due to limited energy, such as the organization of points, lines, and surfaces, the arrangement of individual patterns and continuous patterns, the various two-dimensional and three-dimensional visual changes and combinations of artistic characters, etc., it is impossible for the teacher to use every pattern composition rule or principle.

### D. Application of computer big data technology in art professional courses

As far as accuracy is concerned, the size of the object produced by the computer is absolutely correct, and there is almost no error.

Just as scientists once made brilliant achievements in scientific experiments with the help of test tubes and microscopes. Modern computers, especially their powerful graphics functions, make art teachers even more powerful. In addition to the traditional art teaching mode, supplemented by color screens and keyboards, as much as possible to use all the latest achievements of modern science, such as computer graphics, digital aesthetic theories and new digital art creation theories. Research and create beauty in a scientific and digital virtual three-dimensional world. This is a high degree of unity of art,

philosophy and science, and a real revolution in art. Computer-assisted art teaching does not mean that computers should replace traditional art teaching. The so-called ruler has its shortcomings and the inch has its own length, and even the most advanced technology has its shortcomings.

## V. SYSTEM REQUIREMENT ANALYSIS

As a commonly used tool in system requirements analysis, UML usually includes static and dynamic analysis [2]. In the construction of this system, a static diagram is used to analyse the system requirements, and the overall use case shown in Figure 1 is obtained (the picture is quoted from the Integrated and Secure Web-Based Examination Management System).
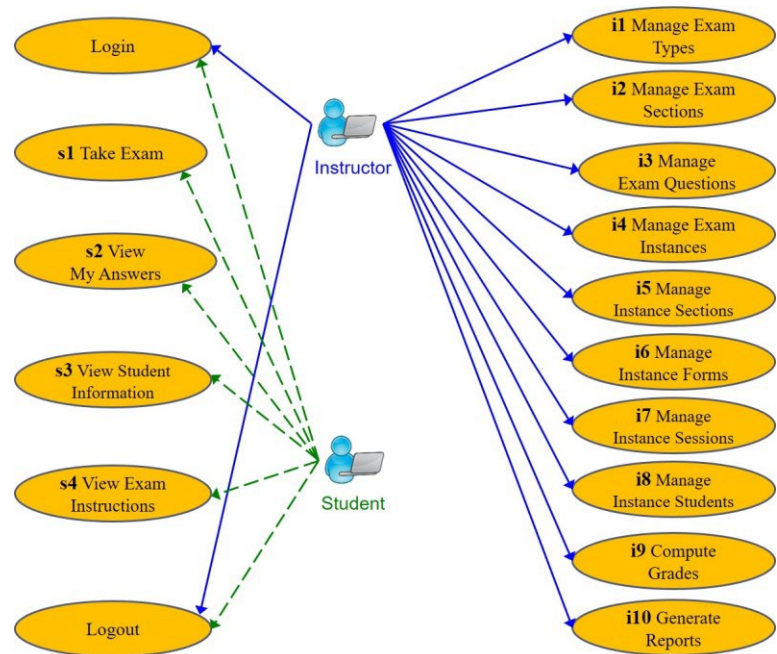


Figure 1. The overall use case analysis of the system

Through the use case analysis in Figure 1, it can be seen that the needs of system administrators are to manage the system, including system authority management, system basic data maintenance, system question bank parameter setting, and news bulletin review and release; teachers and students are closely focusing on online exams, Including the management of the question bank and test papers, the release and query of the results, the management of online examinations, etc.

## VI. ANALYSIS MODEL OF LEARNING BEHAVIOUR IN ART ONLINE COURSES

### A. Classification of online learning behaviours

The collection and measurement of online learning behaviour is the first step in online learning behaviour analysis [3]. The online learning space mainly includes three types of basic elements: the learning system that provides the online learning space, learning resources, and people (including teachers and peers). Based on the relationship between learners and these three basic elements, this research divides learners' learning behaviours in the online learning space into the following four categories:
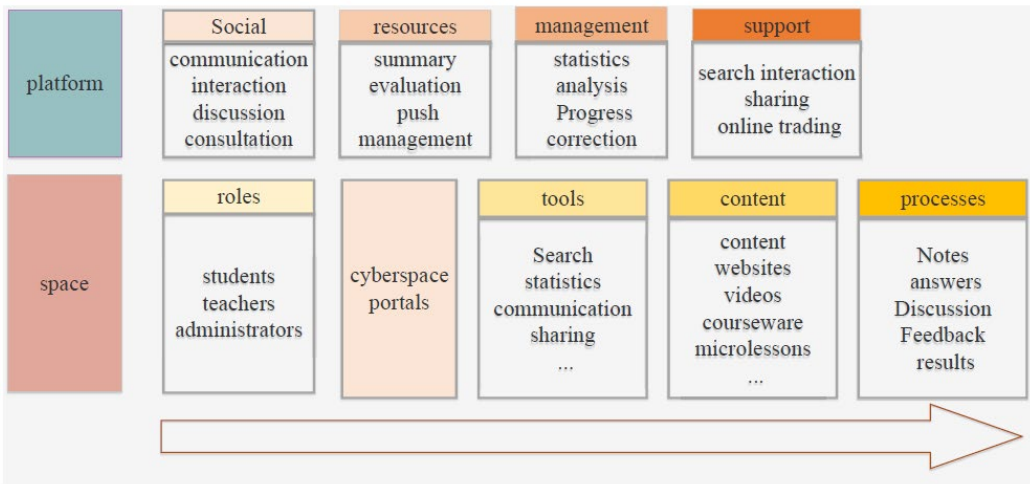


Figure 2. Structural model of the network learning space

1) Independent learning behavior means that learners learn mainly through internalized thinking in the learning process, without having a direct relationship with other elements in the space, such as completing homework independently, writing learning reflections, etc. 2) System interaction behavior means that learners complete learning behaviors by interacting with the learning system, such as logging in, registering, etc. 3) Resource interaction behavior means that learners complete learning behaviors by interacting with learning resources, such as browsing and uploading , Downloading resources, etc. 4) Social interaction behavior means that learners complete learning by interacting with social networks in the online learning space, including various communication activities with teachers and peers, such as asking for help, discussing, etc. Based on this research, the structure model of the network learning space is constructed as shown in Figure 2 (the picture is quoted from Innovative Applications Mode of Network Learning Space in Exercise Physiology Based on Ubiquitous Learning).

### B. Online learning behaviour analysis model based on data mining

After completing the collection of online learning behaviour data, it is necessary to use corresponding analysis methods to analyse the data to dig out the meaningful information contained in the data. When analysing online learning behaviours, this research summarizes three data analysis methods that are versatile and widely used: correlation analysis, classification, and clustering. Different analysis methods can process data from different angles and levels to obtain different analysis results. Different analysis results also have different functions and meanings for different stakeholders in the online learning space. Correlation analysis is often used to analyse the strength of the correlation between different elements, so as to discover and distinguish the core elements of the system [4]. Classification analysis can divide data into different categories according to certain criteria. In learning analysis, classification analysis is often used for prediction, such as the prediction of academic performance. Different from classification analysis, cluster analysis focuses on discovering hidden patterns of data, and its analysis results are often new patterns and laws that have not yet been discovered. Various stakeholders in the online learning space can benefit from these analysis results. Education administrators can adjust relevant policies and improve the functions of the online learning system based on the analysis results; teachers can find possible problems in teaching through the analysis results, and conduct targeted teaching interventions; learners can also understand through the analysis results the learning state of oneself and peers, and consciously make self-adjustment. Figure 3 shows the online learning behaviour analysis model based on data mining technology (picture quoted from Online Behaviour Analysis-Based Student Profile for Intelligent E-Learning).
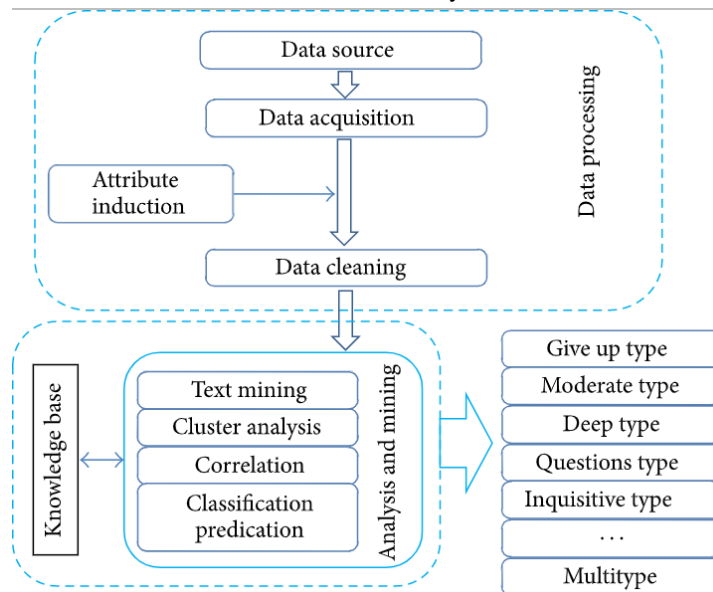
Figure 3. Online learning behaviour analysis model based on data mining technology

## VII. COMPUTER-AIDED ART TEACHING PLATFORM CONSTRUCTION

### A. Construction of teaching platform

The database is the place where data is stored in the teaching platform. The SQL 2005 database is used in this platform [5]. The task of the database is to record data entry, deletion, and modification, and to update the data in time. Part of the data established in the SQL 2005 database is shown in Table I and Table II.

TABLE I. ONLINE Q&A INFORMATION

| Name | type | length | Function | Primary key | Yunkong |
|---|---|---|---|---|---|
| User Power | int | 4 | User rights | No | No |
| Use rid | Varchar | 20 | User ID | Yes | No |
| Usurped | Varchar | 20 | User password | No | No |
| Username | Varchar | 20 | User name | No | No |

TABLE II. STUDENT LOGIN INFORMATION

| Name | Type | length | Function | Primary key | Yunkong |
|---|---|---|---|---|---|
| Username | Varchar | 20 | User name | No | No |
| Password | Varchar | 20 | User password | No | No |

Web search is to find useful information from a large number of web pages and databases, so web search technology is particularly important in platform

assumptions. The HITS algorithm used in this article is designed for web search. The first step of the algorithm is to submit the content that the relevant person wants to search to the search engine, and then the search engine will feed back the search results according to the submitted content. These feedback web pages are arranged in order according to the degree of relevance [6]. The second step of the algorithm Take several search results as a set, denoted by A. Set A must meet the following conditions: 1. Most of the web pages in the collection are related to the search content; 2. The search results are as few as possible, and the search accuracy is as high as possible. Then set the function $h(v), a(u)$ to represent the Hub value and the Authority value of the webpage respectively, the initial value $h(v) = a(u) = 1$, respectively define two operations I and II, of which the operation I is as shown in equation (1).

$$a(u) = \Sigma_{h(v) \in A} h(v) \qquad (1)$$

The calculation of II is as formula (2).

$$h(v) = \Sigma_{a(u) \in A} a(u) \qquad (2)$$

I and II are two iterative calculations for the search results. The value of $h(v), a(u)$ should be normalized continuously during the iterative calculation process, among which

$$a(u) = \frac{a(u)}{\sqrt{\Sigma \left[ a(q) \right]^2}}$$
$$h(v) = \frac{h(v)}{\sqrt{\Sigma \left[ h(q) \right]^2}} \qquad (3)$$

According to the research results of the above-mentioned database and webpage construction, a computer-aided art teaching process has been established [7]. The teaching process structure diagram is shown in Figure 4 (the picture is quoted from the Influence of Computer-aided Instruction Model on Business English Writing Teaching Effect). According to the different functions of the various modules of the system, the system can be divided into two parts: the educator system management module and the learner system application module.
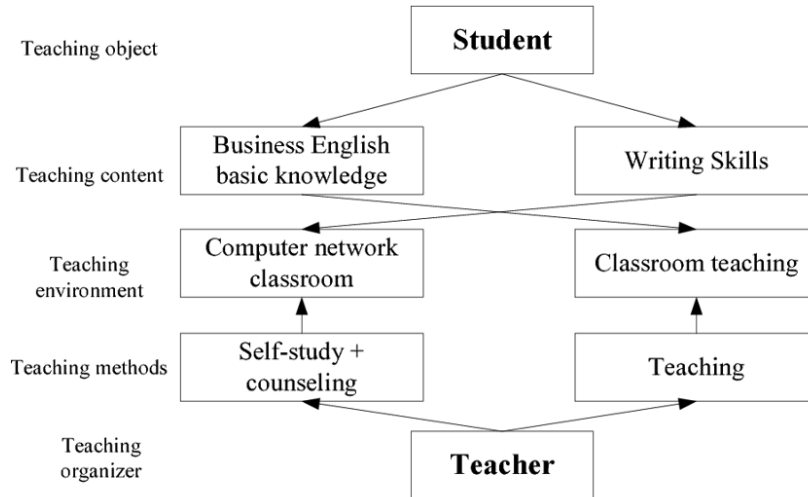


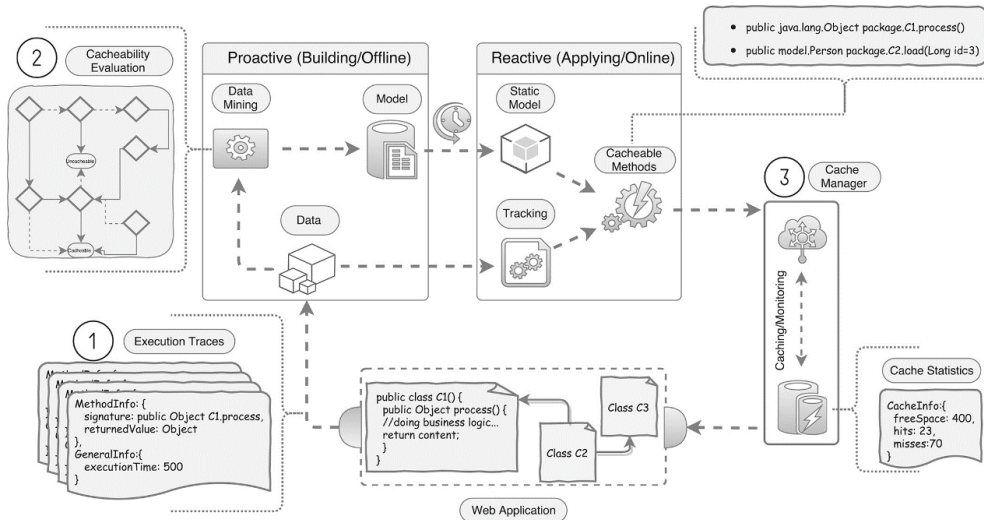Figure 4. Computer-assisted teaching process



Figure 5. Implementation of caching technology for art design mobile learning system

## B. System development environment

By analysing the current mainstream technology, using .NET C# and Objective-C to develop server-side and client-side respectively, using the integrated environment of .NET to solve the problem of low efficiency of traditional manual code writing, and realize it with the help of VisualStudio2008; For the development of the IPAD client, use Apple's XCode development tool. This tool mainly develops Apple applications, and can debug the application code and performance to improve the efficiency of programming development.

## VIII. SYSTEM IMPLEMENTATION

### A. Local caching technology implementation

The mobile learning system contains a large number of art works videos [8]. If the server is accessed through a wireless network connection every time, it will consume a lot of traffic and will also seriously affect the experience of the system. In this regard, for the large number of video files that exist in it, a local caching technology is proposed, and its specific implementation is shown in Figure 5 (the picture is quoted in Automation of application-level caching in a seamless way).

### B. Interaction between client and server

In the realization of the system, the most important thing is to realize the data interaction between the client and the server, so as to ensure that the client can obtain the relevant art design course resources through the client and improve their own capabilities. In this regard, the interaction between the two is implemented based on web services, and the services are packaged and published by using Axis2. The specific method is to compile the file Web Services. cs and the configuration file webservice in the DOS serial port through Web Services. Package the xml and place it in the directory through Visual Studio 2008 to realize the service release, and finally get the basic information of XML.

## IX. CONCLUSION

Computer-assisted art teaching is the main form of classroom teaching in the future, and it can also realize the acquisition and utilization of art education resources. However, the development of computer-assisted teaching is not yet fully mature, and requires educators to continue to study hard and gradually improve in the process, taking the professional needs of students as the starting point. In summary, in order to optimize teaching and develop traditional basic art education to a new stage, we should also use modern educational methods to develop and apply modern educational media, so that aesthetic education can develop imperceptibly and create specific the teaching context is sufficient to realize the existing teaching content.

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