



The Application of Computer Aided Design in the Teaching of Ceramic Art Design

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Abstract. The traditional teaching of ceramic art design can no longer meet the requirements of modern teaching, but it has been proved that the technology of calculator and computer can help teachers to teach better in ceramic art design class. This paper expounds the computer-aided technology, introduces the application of computer-aided technology in the teaching of ceramic art design, and introduces the computer-aided design software of ceramic art design. It provides an effective reference for related art design teaching. Ceramic art design covers ceramic technology and ceramic decoration. Diversified ceramic design shapes promote the development of ceramic products and teaching. Throughout the ages, human beings have created rich and diverse three-dimensional forms according to ideology through existing technologies. Computer-aided design can transform two-dimensional plane into three-dimensional modeling, and the modeling effect is real. The characteristics and advantages of computer-aided design show the application of computer-aided design software in ceramic art design teaching. Finally, the effectiveness of computer-aided design in the teaching process is analyzed, which adds a powerful tool and reference for the teaching of ceramic art design.

Keywords: Ceramic art; Computer aided design; Art teaching; Application analysis

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1 INTRODUCTION

Computer-aided technology in art design refers to interactive technology, graphic transformation technology, surface modeling and solid modeling technology, etc. [1]. By combining these technologies with two-dimensional drawing software, picture and animation design software and

other software, it can be applied to art design to achieve the purpose of art design. Computer-aided technology and software have the following characteristics and advantages: First, improve the accuracy of art design. Through the application of computer-aided technology, art design can make people have an intuitive understanding of art design, not only can the details of art design be accurately adjusted, but also can design the same model as the real thing. Secondly, to improve the effect of art design, the effect of art design is better and more vivid. When people use computer-aided design for art design, they can master the coordination between objects and environment, and comprehensively consider various factors in computer-aided technology, so that the finished products created and designed are more harmonious with the environment, thus showing vivid art design works. Thirdly, computer-aided technology can show the effect of art design on the spot. With the development and change of high technology, people are no longer satisfied with static art pictures, but all want to see an intuitive three-dimensional model of art design. However, computer-aided technology can use its technology to carry out three-dimensional projection on art design, which makes people understand the works of art design more carefully, thus helping people to have a complete understanding of the scheme and organizational structure of art design.

After decades of development from the birth of initial software to the present, computer-aided instruction design has gradually found its own development track. Analyzing from the overall development process, the computer-aided instruction design has mainly experienced five stages: first, the primary development stage [2]. In order to meet people's needs, the computer-aided instruction design has gradually entered the second development stage, that is, people gradually developed the initial theoretical research stage to the practical demonstration stage, followed by the third stage of computer-aided instruction design. In the third stage of development, Due to the improvement of people's demand and the development of Internet information technology, computer-assisted instruction has developed rapidly, and it has been widely popularized in various fields, from mathematics and physics to design, art, medicine and other fields, and achieved certain results. The fourth stage is the emergence of microcomputer, which to some extent accelerates the development of computer-aided instruction design, and makes computer-aided instruction reach a climax in the historical development. The fifth stage is the current stage, which is not only the last stage, but also the beginning of a new stage. It marks that China's computer-aided instruction design will enter a new stage of development and usher in a milestone of computer-aided design.

2 RELATED STUDIES

Tirado-Ramos and Shiflet [3] think that the teachers need to make art designs by hand, and the graphics and models in art designs take a lot of teaching practice in construction, and the graphics or models drawn by teachers can't guarantee the accuracy and three-dimension in art design teaching. Segura et al. [4] He thinks that computer-aided technology is a sharp tool that can help designers to design better works. Its design software usually carries many artistic design functions and a large number of artistic design resources, which can help all kinds of artworks to carry out auxiliary design and analyze the possibility of optimization, and finally let designers work out the best scheme of design drawings. Bi and Pan [5] appropriately added the factors of computer-aided design to the teaching of ceramic art design. Combining all kinds of computer-aided software of teacher's art design can effectively stimulate students' enthusiasm for using computer software and make students interested in studying ceramic art design, thus, the atmosphere of ceramic art design classroom will become more and more interesting. Long [6] analyzed the influence of computer on the aesthetics of art design in the whole ceramic industry from four aspects by comparing with the traditional hand-made ceramic industry at first. Zhu et al. [7] realized that there are two methods of ceramic art creation: traditional manual ceramic making and computer-aided design and numerical control manufacturing. It can be seen from Figure 1 under the condition of limited traditional processing technology, some ceramic art creation ideas may not be

realized. In order to obtain relatively creative ceramic art design works, it can be realized by computer 3D modeling.

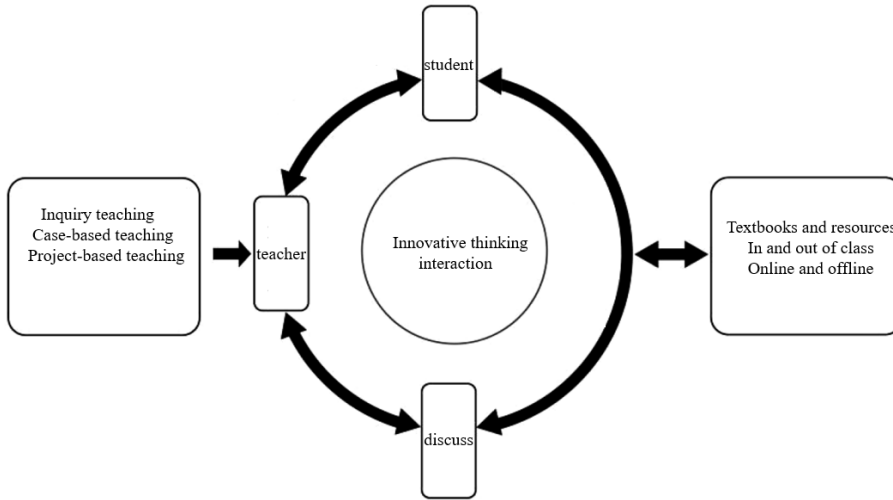


Figure 1: Curriculum framework structure.

There are many kinds of ceramic products, and the shapes are changed, and there are also many corresponding modeling methods. In the art of ceramic design, there are many kinds of computer-aided design methods to model. In this case, designers need to learn to use multiple modeling methods comprehensively, and only in this way can we get twice the result with half the effort. Therefore, when teaching ceramic design to students, teachers should pay attention to teaching students the use of various modeling methods. Generally speaking, there are two kinds of advanced modeling methods that are often used in the design of ceramic products, one is polygon modeling, the other is NURBS modeling. Using these two modeling methods can indeed complete many modeling tasks, but they can't meet all modeling types, and different modeling methods have their own advantages and disadvantages. In actual design, it is necessary to choose the corresponding modeling methods according to the situation. For example, the aromatherapy model, which is common in ceramic product design, does not strictly require comprehensive use of multiple modeling methods, but only one modeling method is used in the design process, which will greatly increase the modeling difficulty, so it is best to learn to use multiple modeling methods.

In fact, computer-aided design is easier to learn than traditional hand-made ceramics, and its biggest advantage lies in its easy modification. After mastering the corresponding software, ceramic art learners can perform deformation, scaling, surface modeling, material application, lighting effect simulation and final rendering of ceramic shapes in the virtual environment, which will open up new precise creative ideas for ceramic creators and provide countless possible methods. Therefore, computer-aided design has the advantages of high precision, high efficiency, high quality and vivid effect. Computer-aided ceramic design can predict the appearance style of ceramic products after the final ceramic production more accurately.

3 THE INFLUENCE OF COMPUTER ON THE ART DESIGN AESTHETICS OF THE WHOLE CERAMIC INDUSTRY

3.1 Application of Two-dimensional Graphics

Two-digit graphics are common in ceramic art design major. For example, the ceramic modeling design course examines the design of modeling drawings. Which has become the teaching focus. Problems such as data measurement deviation, inaccurate contour drawing and weak modeling perception are common in students' mapping maps. In teaching, we introduce computer-aided design to guide students to improve mapping maps, and use the three views in the software interface to clearly show the outline and structure of objects. Through observation of grid data, we can draw the outline of ceramic modeling by selecting points, straight lines and curves, and adjust the contour lines by commands of reconstructing curves and opening points, so as to completely draw various shapes in the three views. Because the background grid in computer-aided design software has high precision size, and the curvature of contour line can be accurate by turning on the locking grid and coordinate axis, this is an improvement and breakthrough compared with the data error in traditional mapping. It can be seen from Figure 2 by comparing the two-dimensional plane three views with hand-drawn maps, the errors and existing problems in hand-drawn maps are found, and the drawings are modified strictly, which not only adjusts the irregularities in hand-drawn maps, but also exercises the modeling perception ability. The drawing design of ceramic modeling can't be achieved overnight, and rich drawing experience needs to be gained through long-term practice. Through the application of computer-aided design in two-dimensional plane mapping, it helps to measure accurate data, grasp the modeling proportion and enhance the concept of plane mapping size in class.

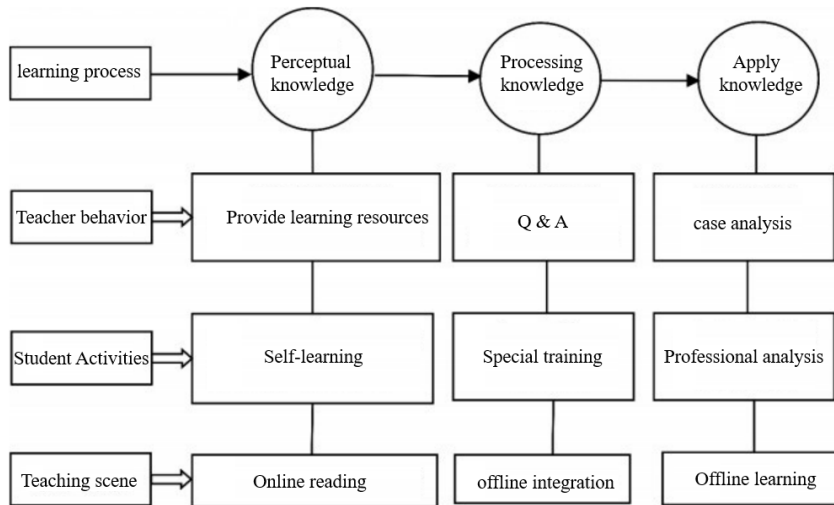


Figure 2: Online and offline mixed teaching design.

Computer-aided ceramic art design makes each series of works and the overall aesthetic style of each work more unified. In the series of works, the same materials are reflected in form, color and texture. What's more, there is no effective connection between the parts of the traditional design methods: each design detail is relatively drawn independently, lacking systematic characteristics. In sharp contrast to this, the application of computer-aided ceramic design can accomplish the drawing of curves, the modeling of three-dimensional objects, and the simulation preview of decorative patterns. Moreover, all the design parts are organically linked together, so the overall

aesthetic style of computer-aided ceramic design is more unified than that of traditional hand-making.

3.2 Analysis of Visual Communication Technology and Art in New Media Scenes

Computer-aided design can not only truly see the preview effect, but also make it easier to design more diversified aesthetic styles of ceramic works through systematic process design such as creating three-dimensional models, simulating materials and textures, lighting, and rendering drawings. In the creative process of the ceramic artist, points, lines and surfaces can be freely adjusted in the computer, and the parameters can be modified in the front view, top view, side view and perspective view at any time, so as to design ceramic art schemes with various styles. Secondly, ceramic materials are given to ceramic art schemes in computer 3D software, and decorative patterns or textures are given to appropriate positions of works. Finally, by simulating the design process of background, light source and environment, the preview, viewing and overall adjustment of visual aesthetic effects of ceramic art works in different scenes are realized. It can be imagined that systematization of computer 3D design software provides considerable convenience for diversification of aesthetic styles of ceramic design schemes [10].

Ceramic art creation can achieve unique texture beauty with computer-aided design. Three-dimensional ceramic printing process under computer-aided ceramic art design is a stacked manufacturing process, which can reproduce unique texture aesthetic feeling and layered texture lines. Due to the forming characteristics of additive manufacturing, ceramic products will have a special annular texture of clay stack, and the outer contour boundary will show layers of texture, which is not only beautiful in texture and shape, but also can reflect the characteristics of ceramic products. Computer three-dimensional ceramic works are printed step by step from bottom to top, and the ceramic surface texture is orderly, forming a unique aesthetic feeling of texture. The texture lines are orderly and have a strong sense of rhythm. Ceramic works modeled and printed by computer have unique texture beauty.) Ceramics can choose to polish these textures, keep them, and consciously design textures with different aesthetic senses to show unique effects. Compared with the texture style of hand-made pottery works, computer-aided pottery can not only imitate the texture of modern pottery strips, but also design complex and diversified texture styles with unique aesthetic feeling, and these texture effects are often unlikely to be produced by hand. More importantly, the texture can be independently controlled by computer, including texture size, shape, color, material, etc., to meet the aesthetic personalized needs of various users.

Computer-aided ceramic art creation can not only build all kinds of strange external structure aesthetic feeling, but also create complex internal structure features. Using computer art processing to form three-dimensional hierarchical aesthetic feeling of rhythmic internal structure, and then using internal filling and three-dimensional printing to facilitate the expression of complex features of ceramic art, which is almost impossible to achieve by hand-making. Not only that, but also can be used for batch customized production of ceramics.

From two-dimensional plane figure shape to three-dimensional modeling shape, the object has a sense of volume and space. Early people don't know how to express their modeling ideology, but design thinking has already taken shape. After the systematic design method of ceramic design, students can draw modeling drawings, but there are some problems and drawbacks from the drawing stage of modeling drawings to the stage of physical presentation. It can be seen from Figure 3 it is found that the ceramic model artwork drawn by the teacher lacks a reasonable proportional relationship, and the details in the artwork cannot restore the characteristics of the real object. In the process of ceramic making, because students have some deviations in detail modeling, the actual effect can hardly meet the teacher's requirements.

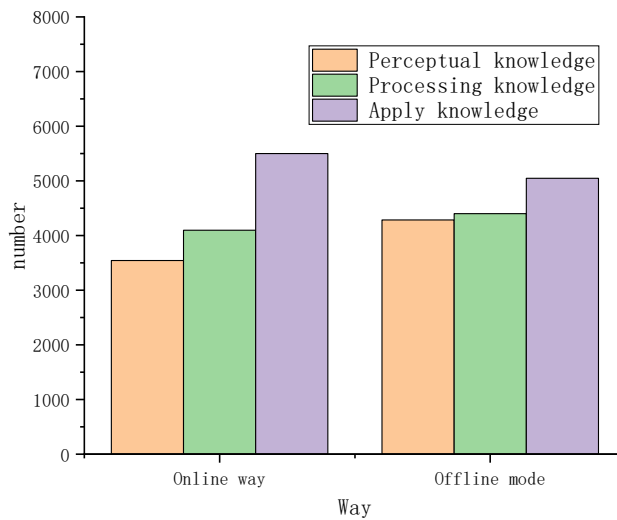


Figure 3: Online and offline teaching methods.

Through rotational molding command, the contour line is edited, thus forming a three-dimensional shape. Students can observe the morphological characteristics of two-dimensional turning to three-dimensional, thus enhancing the aesthetic ability of plastic arts. For the more complex surface modeling, teachers also choose double-regulation sweeping, surface blending, surface editing, etc. through the analysis of ceramic modeling elements to complete the more difficult 3D modeling model. At the same time, after screening the required materials for rendering, check the simulation effect of the modeling, and you can predict the rendering effect in advance before making the real object. Through making 3D modeling with computer-aided software, students have the concept of proportion and size. In the process of making modeling scheme, according to design aesthetics and modeling perception ability, unreasonable parameters can be directly modified by software for many times, and finally higher quality design scheme can be completed.

4 ANALYSIS OF RESULTS

4.1 The Influence of Computer Aided Design on the Whole Teaching Process

The most concentrated influence of computer-aided design on design teaching is reflected in the teaching process. It has great changes and influences on the whole ceramic art teaching design, which makes art teaching show a fresh feeling. First, the computer-aided design has changed the traditional teaching mode, and the classroom has changed from the original paper teaching material to the multimedia teaching. Secondly, computer-aided design has changed the teaching curriculum arrangement of art design. The curriculum teaching of art design specialty is generally composed of teaching material theory teaching and practical design creation. Since the application of computer to art teaching, there are more courses of computer software teaching and software application, and the classroom forms are more diverse. Thirdly, the school should position the computer-aided design more accurately. Although the software design has changed the traditional art design method, making the design faster and more convenient, it also has some disadvantages. Therefore, the school and teachers should know clearly that computer-aided design is a drawing

method of art design, and should focus on its auxiliary features, instead of taking it as the central theme of design, and overemphasize the drawing skills of computers, resulting in dependence psychology. Fourthly, it can be seen from Figure 4: computer-aided design has reformed the assessment mechanism of art major, and the change of teaching objectives and teaching process will inevitably lead to the change of assessment content, in which the application assessment of computer-aided design software is added. Fifth, the cultivation and improvement of teachers' computer art design ability and the increase and improvement of computer-related facilities and software in colleges and universities are needed to ensure the adequacy of teaching facilities and teaching talents.

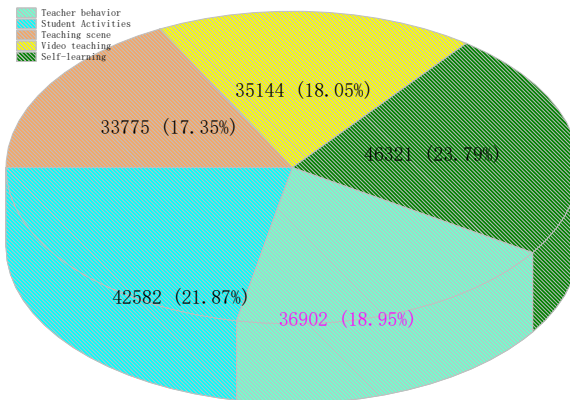


Figure 4: Proportion of various learning methods.

Compared with traditional art design, computer also has the characteristics of rapid application. Once the graphic design in art is finalized, it can be applied and applied on a large scale by means of printing and printing, which is not only rapid, but also has a large number of productions. The process of designing art by computer is also very convenient and rapid. Computer-aided design can be described by three-dimensional graphics in design software, and can express the surface design of works such as light and shade, hue and texture according to different needs of designers. The designer's ideas can be transformed into sketches as soon as possible, and the final draft can be finalized through constant adjustment, so that the drawing time can be shortened and the work efficiency can be improved.

When learning the operation of computer-aided design, students should first be able to successfully design a complete artistic design image, and secondly, ensure the fluency of the design draft, and fully express their ideas in the design draft. To do this, students should first practice computer-aided design repeatedly. It can be seen from Figure 5 which is far from enough for teachers to spend time in class, which can only inspire and guide them. Therefore, teachers can teach relevant knowledge to students by flipping the classroom, so that students can use the time after class to practice repeatedly.

Different from other majors, design major does not need too much theoretical knowledge and applied skills, but pays more attention to aesthetic art and communication between hearts. Designers should have a pair of eyes to discover beauty in daily life, and design this feeling into works of art, and use their own works to infect and influence people. When using computer-aided design for artistic creation, students should not only master the corresponding computer knowledge and application skills, but also cultivate their aesthetic ability and artistic imagination in order to inspire more artistic creation inspiration. Artistic expression needs various forms, so computers can help students show bolder, more diversified and more novel styles in creative forms, and help students express their emotions.

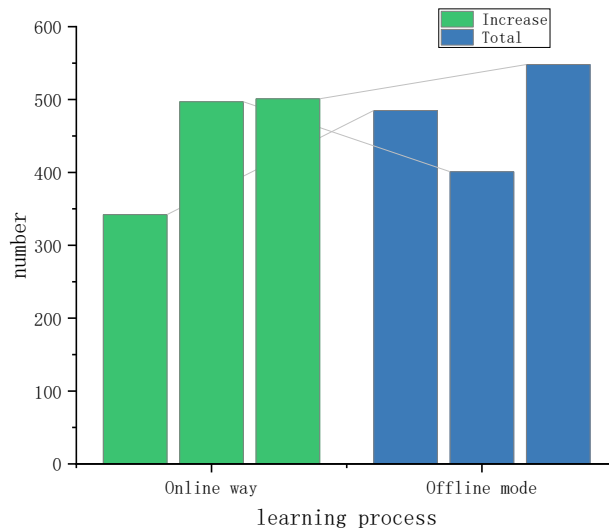


Figure 5: Data diagram of learning process.

4.2 Significance of Applying Computer-aided Technology in Art Teaching

Using computer-aided help in ceramic art design teaching can strengthen students' proficiency in learning software and make students' passion for art design more vigorous, thus making the atmosphere of ceramic art design classroom teaching more intense. First of all, it can be seen from Figure 6 that teaching students enables art design teaching to use computer-aided technology to cultivate students' practical operation ability of art design while telling professional knowledge of art design, so as to achieve the recognition of ceramic art design works by employers. Secondly, the application of computer-aided technology in ceramic art design teaching helps students' innovative thinking in class. Modern art design, whether ceramic art or other art design, needs innovative thinking and novelty. In the teaching of ceramic art design, the application of computer-aided technology can not only train students' conventional thinking, but also greatly improve the innovative thinking in the classroom, because on this platform, thinking imagination can be freely exerted, and unique ceramic craft shapes can be created according to their own thoughts and unique artistic shapes.

Computer-aided design can be used to design almost any ceramic works with aesthetic feeling, not only can we design regular products for mass production, but more importantly, even if the ceramic shapes with strong artistic beauty and complicated surface interpenetration are excellent. The progress of computer-aided design and its application in ceramic product design reinterpret the basic aesthetic factors (composition, lines, colors, technology, etc.) in traditional ceramic design, and provide a new perspective and solution for designers' ceramic creation.

The biggest advantage of software-aided design of ceramic art is its obvious sense of geometric space. Complex geometric beauty constructed by the random combination of straight lines and curves breaks the structure of hand-made pottery and is full of modern aesthetic features. The composition of this geometric structure is very different from the traditional manual ceramic art creation. Using scientific three-dimensional modeling method and NURBS surface to scrutinize the aesthetic characteristics of ceramics, the ceramic art forms show diversified geometric beauty of intersecting, rotating, staggering and alternating curves and broken lines.

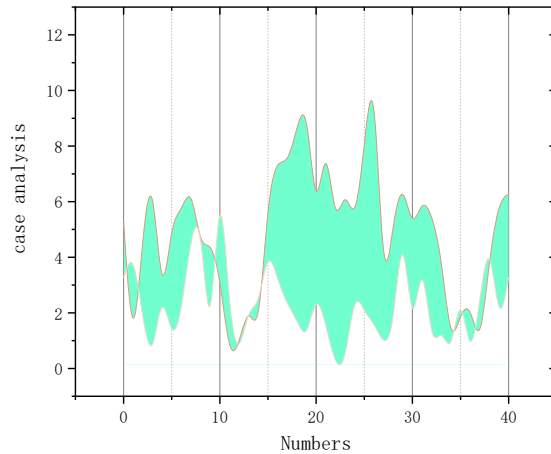


Figure 6: Wireframe diagram.

The appearance of computer-aided design not only it can be seen from Figure 7 the creative vision of traditional ceramists, but also brings new visual beauty and experience to consumers. It can be said that it is a re-creation of traditional ceramic art and displays with a brand-new look, which meets the development needs of the aesthetic trend of the generation society. Geometric ceramic products will become a new field of ceramic industry in the future.

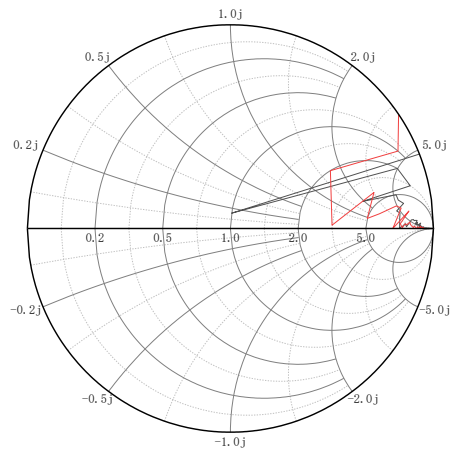


Figure 7: Classroom teaching grid.

5 CONCLUSION

In short, computer-aided design is a new form of art design. It has a great influence on the whole field of art design and art design teaching in colleges and universities. It not only makes art design more efficient and convenient, but also gives students richer art design resources. Most importantly, it also changed the teaching process of art design in colleges and universities, and reformed the teaching form. With the application of computer-aided ceramic art design, the

aesthetic style of ceramic design has entered the stage of differentiation and personalization from the traditional unity and model, and consumers' demand for diversified aesthetic styles, unique or predetermined products is gradually increasing. According to the needs of ceramic consumers, ceramic designers can use computers to create and manufacture accurately, thus realizing the possibility of low-cost diversified customization of ceramic creation. This "diversified" consumption pattern with added value of ceramics is bound to become the inevitable trend of ceramic design and industrial development.

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