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The Representation of Urban Commoner Culture in Ming-Qing Ceramic Painting: A Case Study of Thematic Inspirations from Ming-Qing Novels

Chengyao Dong[1]

[1]*Jingdezhen Ceramic University, JingDeZhen, 333000, China*

[*]Corresponding author. Email: 863475578@qq.com

Abstract

The ceramic paintings in the Ming and Qing dynasties formed their own unique features. Whether in the selection of themes, artistic styles or artistic forms, they all showed strong characteristics and trends of urban folk culture. The formation of this trend is closely related to the aesthetic tastes of the society and the values of literary works at that time. Combining with the social background of the Ming and Qing dynasties, this paper takes the themes of novels in the Ming and Qing dynasties as the entry point of the research, and analyzes the manifestation forms of novel themes in ceramic paintings. It is found that the handling of the expressions, costumes and movements of the characters in ceramic paintings, as well as the popular and intuitive narrative plots and the expression of glaze colors, all prove the characteristics of urban folk culture contained in the ceramic paintings of the Ming and Qing dynasties.

Keywords: Ceramic Painting; Urban Folk Culture; Novels of the Ming and Qing Dynasties

1. INTRODUCTION

Urban folk culture is a cultural phenomenon that emerged with the formation of the urban citizen class. It reflects the daily lives of ordinary people and encompasses a wide range of contents. Among this cultural category, novels, with their unique narrative charm, have become an important representative of urban folk culture.During the Ming and Qing dynasties, the scenes and character stories depicted in novels frequently appeared in the decorative patterns of ceramics. [1]These patterns were not only deeply loved by the people at that time but also became a prominent feature of ceramic art.These exquisite ceramic works are not only widely popular in China, but also many porcelain items produced by folk kilns are exported overseas. This allows Chinese ceramic art and novel culture to transcend national boundaries, enabling people around the world to appreciate the unique charm and far-reaching influence of traditional Chinese culture.

2. THE URBAN CHARACTERISTICS OF THE AESTHETIC TRENDS OF CERAMICS AND THE VALUE ORIENTATIONS OF NOVELS IN THE MING AND QING DYNASTIES

During the Ming and Qing dynasties, both the aesthetic trends of ceramics and the value orientations of novels exhibited a distinct trend of secularization. Firstly, there was a significant transformation in the aesthetic concepts of ceramics. It shifted from the previous aesthetic ideals that pursued gentleness, elegance, and implicit connotations to forms of expression that were more in tune with the interests and tastes of folk life. Painted porcelain wares, which were once despised by literati and refined scholars, were widely favored by the general public because they vividly presented the pleasures of folk life. Especially, the works from folk kilns, in order to meet the aesthetic needs of the broad masses of the people, began to extensively adopt characters from novels and operas as well as historical stories as decorative themes. These works were not only large in quantity but also reached a

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rather high level of artistic accomplishment. The aesthetic characteristics presented by the aesthetics of ceramics, [2] as Li Zehou once stated, "The aesthetic appeal of artistic forms is inferior to the appreciation of the content of life, and elegant tastes give way to secular realities."

Secondly, in terms of the value orientation of novels, the works of the Ming and Qing dynasties gradually abandoned the obscure expressions in classical Chinese and instead adopted vernacular Chinese that was easier for the general public to understand. In terms of content, these novels placed more emphasis on subjective expression, delved deeply into the inner world of individuals, emphasized the sincerity of emotions and the richness of imagination, and relatively reduced the traditional didactic elements. These changes signify that novel literature was moving towards the direction of secularization. For example, widely circulated classic works such as *Romance of the Three Kingdoms, Water Margin, Journey to the West, the Golden Lotus,* and *Dream of the Red Chamber* all fall within the category of popular novels. With their language and plots close to real life, they were deeply loved by the people at that time.

There are naturally various reasons contributing to this urban characteristic phenomenon. Firstly, with the development of the commodity economy and the emergence of the sprouts of capitalism, this economic transformation promoted the rise of cities and the expansion of the urban citizen class; [3]Secondly, in the cultural field, the trends of realism and humanism became the mainstream; Finally, in the Ming and Qing dynasties, the policies gradually lifted the restrictions on the sea ban, and the commercial activities along the southern coast gradually recovered, and maritime trade thrived again. The improvement of these policies provided conditions for the development of urban folk culture. It symbolizes the renewal of people's aesthetic consciousness, indicating that people are eager for novelty and difference and actively pursuing a more open new life.

3. THE URBAN CHARACTERISTICS PRESENTED BY THE CHARACTER IMAGES AND ARTISTIC NARRATION IN CERAMIC PAINTINGS

[4] The novel literature in the Ming and Qing dynasties is a vivid manifestation of urban folk culture. Therefore, it was very popular to paint novel themes on porcelain, and this practice was highly regarded because of its storytelling, interestingness and informativeness. It not only enables contemporary people to have a deeper understanding of history through historical allusions but also provides an intuitive visual experience. The ceramic paintings in the Ming and Qing dynasties remarkably demonstrated the urban folk customs, which were mainly reflected in three aspects: Firstly, the character images in the porcelain paintings; secondly, the popularity of the narrative texts; and thirdly, the changes in the glaze colors.

3.1. The Character Images Bear a Strong Imprint of Urban Life

The creation of character images plays a pivotal role in novel writing. In the ceramic paintings of the Ming and Qing dynasties, it became an important creative theme. Many ceramic painting works from the Ming and Qing dynasties drew inspiration from the character images in the popular novels of that time. [5] Due to the social environment at that time, many literati and painters chose to live in seclusion in urban areas. The direct participation of literati and literati painters in ceramic painting, on the one hand, enhanced the cultural taste of ceramic painting, and on the other hand, contributed to the urban flavor of literati ceramic paintings. Thus, in artistic creation, it broke free from the traditional constraints of the Confucian ritual and music culture that had long emphasized "cultivating morality and assisting human relations." They used realistic creative techniques to enthusiastically praise the beauty of secular life. Therefore, the portrayal of character images on porcelain bears distinct marks of life and is closer to the daily life of ordinary people.

As shown in Chart 1, the blue-and-white figure paintings are all selected from the classic character images in the novels of the Ming and Qing dynasties. For example, item 1-1 in the table is a blue-and-white snuff bottle with the figure of Wu Song from the Yongzheng period of the Qing Dynasty, which is collected in the Princeton University Museum. Wu Song holds a spear in his hand and has a ferocious expression, indicating that he is preparing for a battle. The painting vividly shows the characteristics of the character.For instance, items 1-2 and 1-3 in the table are a bowl-shaped censer from the Chongzhen period of the Ming Dynasty. This censer uses Zhejiang cobalt blue to outline the

four main characters from Journey to the West—Tang Sanzang, Sun Wukong, Zhu Bajie, and Sha Heshang. Sun Wukong is leading the White Dragon Horse. Tang Sanzang is walking with his right hand touching the alms bowl and his left hand leaning on the monk's staff. Zhu Bajie with big ears and Sha Heshang carrying the burden are following behind. The characters have a humorous feature. Sha Heshang's expression is slightly exaggerated. Through the characteristics of the characters, one can imagine the hardships and joys of the four disciples on their journey.As shown in item 1-4 of the table, it is a brush pot from the Tianqi period of the Ming Dynasty, depicting the story of Cao Cao presenting a robe. The character images of Cao Cao and Guan Yu are intercepted. It can be seen that the patterns are delicate and the scene is magnificent. Guan Yu stands on the bridge with his sword horizontally, lifting the robe with his sword, and Cao Cao, wearing an official hat, is closely following behind.

There are some remarkable commonalities among these character images: Their expressions are vivid, and their costumes are natural and casual, obviously designed to meet the actual needs of production and labor at that time; their movements are exaggerated in amplitude, full of a strong flavor of life. Urban folk culture is a kind of culture that aims to showcase the characteristics of ordinary people's production activities, lifestyles, behavioral customs, religious beliefs, ethical concepts, aesthetic tastes, value orientations, etc., and it has distinct folk characteristics.

It can be clearly felt from these blue-and-white character images that, compared with the solemn expressions and gorgeous costumes of the characters in previous figure story paintings, the portrayal of the character images on porcelain in the Ming and Qing dynasties presented a completely different style. They were no longer presented in a stylized way. [6]Instead of being sticking to forms, they were filled with a strong flavor of life, reflecting the urban characteristics of the brushwork,Visually represent the characters in the novel in an intuitive way. This is precisely one of the important features that distinguish the ceramic paintings of the Ming and Qing dynasties from those of previous generations.

Table 1. Arrangement of Character Images in Blue-and-White Ceramic Paintings of the Ming and Qing Dynasties

Part of the Porcelain	 1-1	 1-2	 1-3	 1-4
Period Shape of the Porcelain Vessel	Yongzheng period of the Qing Dynasty Snuff bottle	Chongzhen period of the Ming Dynasty Bowl-shaped censer	Chongzhen period of the Ming Dynasty Bowl-shaped censer	Tianqi period of the Ming Dynasty Brush pot
The characters from novels depicted in the painting	*Water Margin* Wu Song	*Journey to the West* Tang Sanzang	*Journey to the West* Zhu Bajie, Sha Heshang	*Romance of the Three Kingdoms* Cao Cao, Guan Yu

3.2. The Popularity of Narrative Texts

The novels in the Ming and Qing dynasties, with their classic storylines, have become an indispensable source of inspiration in ceramic painting. [7] These novels are long episodic novels developed on the basis of popular novels in the Song and Yuan dynasties. They are written in vernacular Chinese, making the huaben novels more accessible and understandable. This breaks the tradition that novels in the past only used classical Chinese for narration, thus greatly expanding the

audience base of novels. Different from poems, ci-poems, essays and odes that express the feelings of literati, and also different from the classics, histories and academic works that convey moral principles and establish theories, these novels are a kind of commercial culture for the entertainment and leisure of the common people.Ceramic painting reinterprets the story lines in the novels with ceramic pigments, which is more straightforward and easier to understand compared to textual narration. On the one hand, this enriches the creative themes of ceramic painting, and on the other hand, it also promotes the spread of urban culture.

As shown in Table 2, these are all plot elements selected from the classic novels of the Ming and Qing dynasties. For example, in item 2-1 of the table, it is a multicolored plate from the Kangxi period of the Qing Dynasty, depicting the plot where Lin Chong captures Hu Sanniang alive. This plate is painted with six colors, namely green, red, yellow, manganese purple, blue enamel, and black. In the middle is a general, and the scene depicts the battle between the soldiers and the rebels. In the picture, the soldiers are holding spears and have fierce expressions, indicating that a fierce battle is taking place. It can be seen that a fierce battle is taking place. Item 2-2 in the table is a six-sided vase with plate-shaped ears, decorated with pink enamel patterns depicting human figures and stories, which was made in the middle period of the Qing Dynasty. Even today, it is still a very eye-catching handicraft.The plot depicted on the body of the vase is carefully selected from Chapter 29 of *The Plum in the Golden Vase*, titled "The Immortal Wu Determines One's Life through Physiognomy". From the mouth of the vase to the bottom foot, it is evenly divided into six prism faces. Each face is exquisitely painted with the stories of the characters from *The Plum in the Golden Vase.* The connecting lines between each picture are outlined with gold color. The colors are bright and harmonious, and the overall decorative layout is rigorous and complete. Item 2-3 in the table is a multicolored plate from the Yongzheng period of the Qing Dynasty. The patterns on this plate are derived from Chapter 8 of *Romance of the Three Kingdoms*, which is titled "Lord Wang Skillfully Uses the Coiling Serpent Stratagem, and Prime Minister Dong Creates a Ruckus in the Phoenix Pavilion".Item 2-4 in the table is a work from the early Chongzhen period of the Ming Dynasty. [8] This vase is selected from Chapter 88 of *Journey to the West*, titled "The Dharma Assembly Is Held in Yuhua When the Monk Reaches Spiritual Enlightenment, and the Heart Ape and the Wood Mother Instruct the Disciples". Although the lines depicting the characters are simple and concise, they perfectly present the dynamic expression of King Yuhua "kneeling down and bowing", as well as the state of the little princes being sincerely convinced and eager to retain the master and his disciples. It can be seen that the ceramic painting at that time had reached a very high level.

The popularity of the plot depicted in ceramic paintings is a remarkable feature of porcelain in the Ming and Qing dynasties. Overall, the paintings on the four ceramic wares listed in the table share some prominent characteristics: The narrative technique is concise and clear, enabling viewers to easily understand and have a clear view at a glance. Through the depiction of time, place, events, as well as the actions, expressions and costumes of the characters, people can quickly identify which novel plots these paintings represent. In terms of composition, these works are often quite rich and full, reflecting the richness of the composition in porcelain paintings at that time. By varying the thickness of the lines, arranging them in a dense or sparse pattern, and creating contrast in the shades of colors, artists skillfully create the effects of foreground and background, demonstrating that they have borrowed and absorbed the composition techniques of woodblock prints. This popular expression is closely related to the cultural background of that time. The prevalence of urban culture made such easy-to-understand patterns more acceptable to the general public, and at the same time, it also met the market demand. Therefore, these works not only showcase the charm of secular entertainment such as literary and artistic qualities, plot elements and humorous fun, but also closely connect with the preferences of ordinary people in terms of aesthetic style.

Table 2. The Arrangement of Plot Elements in Ceramic Paintings during the Ming and Qing Dynasties

Part of the Porcelain	 2-1	 2-2	 2-3	 2-4
Period vessel shape	Kangxi period of the Qing Dynasty Plate	Middle period of the Qing Dynasty Six-sided vase	Yongzheng period of the Qing Dynasty Plate	Chongzhen period of the Ming Dynasty Cylindrical vase
The plot of the novel depicted in the painting	*Water Margin* Lin Chong Captures Hu Sanniang Alive	*The Plum in the Golden Vase* The Immortal Wu Determines One's Life through Physiognomy	*Romance of the Three Kingdoms* Lu Bu Meets Diaochan	*Journey to the West* The Dharma Assembly Is Held in Yuhua When the Monk Reaches Spiritual Enlightenment

3.3. The Fashionability of the Semantics of Glaze Colors

[9] Before the Ming and Qing dynasties, ceramic decorations mainly featured techniques such as flower carving, scratching, and printing. During the Ming and Qing dynasties, the remarkable development of colored glazes made the combination of Chinese painting techniques and porcelain-making craftsmanship more mature. Underglaze-colored porcelain with a strong Chinese style reached a new stage of development, thus bringing an end to the situation where the glaze colors of porcelain before the Yuan Dynasty mainly imitated the appearance of jade and silver. Famille rose, cloisonné enamel, five-color porcelain, etc. in the Ming and Qing dynasties opened a new era for the system of Chinese ceramic decorative art. Looking at the development of aesthetics throughout the dynasties, the art of porcelain pursues an aesthetic concept that is gentle, refined, implicit and reserved, emphasizing the beauty of the natural and spontaneously formed artistic conception, rather than complex carving or straightforward expression. [10]Since the Yuan Dynasty, ceramic painting has gradually developed and reached its historical peak during the Ming and Qing dynasties. The richness, vividness and variety of colors more appropriately met the aesthetic needs of that time. The ceramic works of the Ming and Qing dynasties, with their colorful hues, show us a splendid and diverse world. This magnificent and vivid beauty forms a sharp contrast with the simple elegance and profound beauty of the single-color porcelain that was pursued before the Yuan and Ming dynasties.

As shown in Table 3, the colored porcelain from the Ming and Qing dynasties is selected. Although they are of different types and themes, they all display the unique artistic style of the Ming and Qing dynasties in terms of the presentation of glaze colors. Item 3-1 in Table 3 is a famille rose and gold-traced lion-ear vase from the Daoguang period of the Qing Dynasty, which is currently collected in the Victoria Museum in the UK. With its magnificent colors and exquisite decorations, this lion-ear vase vividly reproduces a classic scene from the popular novel *Water Margin.* [11] Up to now, many houses in Europe still retain large display items of this style. The gorgeous colors and elaborate decorations are not only favored by the domestic people during the Ming and Qing dynasties but also regarded as art treasures abroad. Item 3-2 in the table is a five-color plate depicting the heroes of *Water Margin* from the Yongzheng period of the Qing Dynasty, which is currently collected in the British Museum. The theme is selected from the thirty-six warriors and characters in *Water Margin*. This plate adopts the overglaze color process, with green as the main tone, dotted with different shades of red, and the faces of the characters are depicted by means of line drawing, which portrays the different expressions and characteristics of each person. As shown in Item 3-3 of the table, it is the interior of a

blue-and-white Kongming bowl from the Ming Dynasty. The theme is selected from *Romance of the Three Kingdoms*. The color of this bowl is chosen as blue-and-white pigment, which is used to paint the characters, and the different shades of the blue-and-white pigment are utilized to show the characteristics of the characters.

Overall, compared with the previous periods, the ceramic paintings of the Ming and Qing dynasties have shown remarkable changes in color selection. They exhibit a more modern sense of fashion and are closer to the aesthetic tastes of ordinary people. The craftsmen at that time were highly skilled. They used different brushwork techniques when applying various color materials, which is particularly evident in the use of ink and color. For example, [12] when painting blue-and-white porcelain, they took fully into account special techniques such as water separation and water collapse. In the production of five-color porcelain, they focused on the effect of flat application of a single water-based color material. When creating famille rose porcelain, they adopted the washing and dyeing technique. These exquisite techniques have designed a unique "system of using ink and color" for ceramic paintings, providing more convenient conditions for the expression of glaze colors in the Ming and Qing dynasties and making the forms of expression of ceramic art more diverse and colorful.

Table 3. The Color Representation in Ceramic Paintings during the Ming and Qing Dynasties

porcelain	 3-1	 3-2	 3-3
Period Shape	Daoguang period of the Qing Dynasty Lion-ear Vase	Kangxi period of the Qing Dynasty Plate	Ming Dynasty Kongming Bowl
Novel	*Water Margin*	*Water Margin*	*Romance of the Three Kingdoms*

4. CONCLUSION

The characteristics of urban culture presented in ceramic paintings are one of the important features of ceramic paintings during the Ming and Qing dynasties. Looking back through history, significant cultural transformations took place during the Ming and Qing dynasties. There was a shift from the refined to the popular culture, and the popular culture was fully demonstrated. This led to the secularization of the aesthetic trends of ceramics and the value orientation of literary works in the Ming and Qing dynasties, which inevitably brought about changes in the themes and styles of ceramic paintings.Among numerous novels, those vivid character images and captivating plot elements were distilled as the source of inspiration for ceramic paintings. With the help of the high-quality materials at that time and the exquisite craftsmanship of the artisans, these elements were skillfully integrated into ceramic decorations. The porcelain wares with simple and intuitive images, easily understandable artistic narrative methods, and rich and colorful glaze colors were more likely to be loved and accepted by the general public, thus forming the unique style of ceramic paintings in the Ming and Qing dynasties.

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Limitations and Possibilities of Technological Tools in Artistic Creation

Zhan Li[1]

[1]*Beijing Institute of Fashion Technology, Beijing, 100029, China;*

[*]Corresponding author. Email: 420497085@qq.com

Abstract

In the present work, the potential of technologies as artistic tool and their impacts on artistic creation are examined. Specifically, the evolution of artistic tools is reviewed first, with a focus on how the limitations of tools have stimulated the imagination and emotional expression of artists. Subsequently, it analyzes how technology has transformed the role of artistic tools, from Duchamp's ready-made art to the application of digital technology, virtual reality, and artificial intelligence, and has provided unprecedented possibilities for artistic creation. However, this change also brings challenges, such as the possibility that artists may overlook the deeper potential of tools in their pursuit of new tools and effects. Per the research findings, recommendations are proposed that artists should consciously utilize technological tools as a medium for expressing ideas and emotions rather than merely using them as a means for visual effects, and only in this way can technologies be better integrated with art to provide more possibilities for future artistic creation.

Keywords: Technology; Artistic Creation; Restrictive; Possibility

1. INTRODUCTION

Technology provides a tool for humans to pursue higher efficiency by liberating them from basic living needs and thus giving them the leisure to discover the beauty of life. In today's world, technology penetrates every aspect of human life. Just as Duchamp used ready-made products as artistic tools, technology has gained increasing popularity among artists in their artistic creations. As the combination of technology and artistic creation gains broader attention, more and more artworks generated this way begin their debuts in major art museums and exhibition halls. At present, most studies on this combination are from the perspective of art design, and their main objective is to enhance the aesthetic effect and lifestyle atmosphere of technological products. The integration of technological tools into artistic creation has increasingly become an important way for contemporary culture to be reflected, bringing new possibilities for both technological and artistic issues.

2. THE ROLE OF TOOLS IN ARTISTIC CREATION

A quick glimpse of the primitive cave paintings and other early works will reveal that the painting tools initially used by people include plants or minerals, natural or briefly processed, such as black obtained by burning wood or brownish red obtained by grinding iron ore. With the increase in social practice experience, people's requirements for tools grow higher as well. Artists gradually discover the expressive characteristics of specific tools in creative practice, and by strengthening this characteristic, they finally create tools such as Eastern ink painting and Western oil painting that carry profound cultural connotations. Though painting tools have been constantly evolving in ancient times, this evolution shows a clear direction, which enables later generations to discover the development logic in view of lessons from history.

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There is no denying that tools have their limits no matter how advanced they develop or evolve: the brownish-red color of iron ore lacks luster; the strokes of oil painting lack variation; the color of ink wash is monotonous. These limits, rather than diminish the artist's desire to express themselves, unleash more of their imagination. Therefore, the artist had to cast a subjective eye when appreciating the artworks before them: the brownish-red color was the color of the buffalo, and those black lines represented the human form. The subjective appreciation is arbitrary, but this bold move demonstrates one of the earliest human behaviors to escape from the natural world and has become another ability humans have beyond animals besides rational thinking, namely emotion.

The relationship between the limitations of tools and the expression of emotions is ambiguous. Artists' emotional expression is not arbitrary, but an expansion of emotions in a personalized way conforming to the characteristics of tools. Emotional expression in artistic creation, so to speak, is achieved through the use of tools. Excellent artists such as Van Gogh, despite their love of the colors of Japanese "ukiyo-e" paintings, would not use oil paintings for simulation. Instead, they would translate the language of these prints into the language of oil paintings to give a new visual effect. Similarly, Pollock mixed materials such as sand and sawdust into oil painting materials for artistic creation, in hopes of using unconventional materials to go beyond the linguistic boundaries of oil painting materials.

Therefore, in artistic creation, tools not only provide the material basis for the expression of thoughts and emotions, but also come as a key driver of the development and innovation of artistic forms. "The diverse forms of artistic expression are the result of the continuous advancement of science" [1]. Though inevitably confined by the characteristics of tools during artistic creation, artists often "translate" what they see and feel, integrating their perspectives and emotions into their works to give birth to novel forms of art with unique charm. The relationship between the limitations of tools and the artists' emotional expression is also interactive: artists respect and enhance the characteristics of tools in a personalized way to give expression to their emotions, and hence, the expression of emotions is realized by exploring the possibilities of tools.

3. THE ROLE TRANSFORMATION BROUGHT BY TECHNOLOGY TO CREATIVE TOOLS

In traditional painting, the evolution of tools reflects the accumulation of social practice experience and the deepening of artistic expression techniques. Tools give expression not only to the artist's artistic inspirations but their emotions and creativity, driving the continuous development and innovation of art. The introduction of new technologies to artwork production, however, has brought about a range of shifts in the role that tools play in artistic creation.

These shifts can be traced back to the modern art movement in the early 20th century. In 1917, French artist Marcel Duchamp named an ordinary urinal "Fountain" and placed it in an exhibition hall, which challenged the definition of traditional art and marked the beginning of the use of ready-made products for artistic creation. Duchamp's innovation shattered the norm that artistic creation must rely on traditional tools such as brushes and pigments and paved the way for the diversification of artistic creation tools. Inspired by Duchamp, artists began to explore the use of various ready-made products in their daily lives for artwork creation, from everyday objects to discarded materials, from sound and light to behavior and concepts. Tools for artistic creation became all-encompassing.

The emergence of ready-made art contributed to the diversification of artistic tools, leading to a shift in the role of tools in artistic creation. When artists use behavior or installation to create an art piece, the aesthetic significance they consider goes beyond the mere spatial and compositional relationships between elements. For example, in Yves Klein's performance artwork "Jumping into the Void," his leap into the air is a fleeting event, but the artist founded a newspaper to cover this leap. Newspapers are usually used to report important news events, which are the realistic carriers of certain historical moments. Therefore, this newspaper endows events that leap into the void with solidity. However, the newspaper founded by Klein only existed for one day, which resulted in the event ultimately returning to nothingness. By overlapping reality with virtuality, the artist incorporated an abstract structure of "instant eternal instant" into his work, filling in the concrete elements of the work

in such rich layers, finally forming a memorable beauty. This event suggests that new artists are starting to consider the more comprehensive relationship between tools and art creation like a director.

Nonetheless, the change in the role of tools in art creation has gone far beyond this. The advancement of emerging technologies, such as digital technology, virtual reality, and artificial intelligence, provides artists with more creative tools and means, offering infinite possibilities for artistic creation. With these advanced technological means at hand, artists create unprecedented visual and sensory experiences, exploring new fields and forms of art. However, artists can be overwhelmed by the diversification of technological products. Contemporary technological and artistic tools cannot be seen solely as ready-made products; they have become tools capable of independently completing works. For example, the popular painting software "Procreate" and sculpture software "Zbrush" have their own unique modeling language and aesthetic characteristics. Although these software packages are designed to simulate real-life painting and sculpture, their colors, strokes, and scratches emit a distinct air of digital art. In addition, digital art tools such as TouchDesigner and OpenBrush have completely created another independent art form with unique artistic effects, and if we wish to gain such effects, we must use relevant tools. As Cao Liping stated in her article "3D Printing and Lacquer Art Between Art and Technology", using new technological means, "artists have broken through traditional creative limitations and opened up new ways of artistic expression"[2].

The effect of each tool is specific, and the creative inspiration and emotional expression of artists are often diverse and complex. Although technological tools have brought rich possibilities for creation, they have also to some extent constrained the purity of artistic creation. For example, traditional painting tools such as brushes and pigments have formed unique artistic language and emotional communication methods through long-term use. Painters express their inner emotions through the weight of strokes and the intensity of colors. However, in the field of digital painting, although painting software is powerful and can simulate various traditional brushstrokes and even create unprecedented visual effects, artists need to familiarize themselves with the software's operating logic and adapt to its preset color modes, stroke parameters, etc. before using it. During this process, the emotional coherence of artistic creation may be disrupted. When artists want to express a delicate and hazy emotion, traditional painting can easily achieve it through natural blending of pigments, while in digital painting software, it may take a lot of time to debug parameters such as brush transparency and flow rate in order to barely approach the ideal effect. Moreover, with the rapid development of technology, various emerging art tools continue to emerge. In addition to common painting and sculpture software, there are also Processing that can generate dynamic images and Arduino that can implement interactive art. Every new tool has its unique technical principles and forms of expression. If artists want to master multiple tools to enrich their creative methods, they need to invest a lot of time and energy in learning. For artists who are accustomed to focusing on a few traditional creative tools for a long time, this is undoubtedly a heavy burden. At the same time, due to the extremely fast pace of tool updates, new versions or completely new tools have emerged just after becoming familiar with the characteristics of a tool, further exacerbating artists' anxiety in tool selection and use. In this situation, the emotional expression that artistic creation should focus on is often disrupted by the use and updating of tools, which undermines the core position of artistic creation.

This has caused a series of problems: If one wishes to achieve e a certain effect, one has to learn the specific tool that gives that wished effect, and as the technological tools grow, one may get exhausted on their way of endless learning.; or if one wishes to explore possibilities within the limitations of a specific tool for a particular effect, the quick update and iteration of the related software will also make it challenging for one to adapt. In such interactions, tools have already taken the lead over artists, making them dominant while the artists their vassals to showcase various tool effects.

4. ARTISTIC STRATEGIES FOR EFFECTIVELY UTILIZING TECHNOLOGICAL TOOLS

The exploration of the possibilities of limited tools by artists resembles excavating the possibilities of the subject, and it is how the value of the subject can be displayed. The diversification of tools focuses only on the visual effects that stand out from those enabled by existing tools, making it

difficult for artists to explore more possibilities for one specific tool. As artists constantly seek new tools and effects, they may find it hard to tap into their creativity from just one tool. The pursuit of visual effects then gradually degenerates into the pursuit of visual stimulation, just as people addicted to short videos find it increasingly difficult to finish a movie. The possibility of the subject is thus replaced by the diversity of the object.

The alienation of human beings by tools is a long-standing topic, and artistic creation is regarded by philosophers such as Guy de Poe and Marcuse as the ultimate solution to this problem. The alienation of artists by art tools can only be solved by the artist's consciousness. The increase in the variety of tools is inevitable amidst the wave of technological progress, and technological progress is an irresistible path determined by human nature, and to curb the development of tools is contrary to reason. Therefore, we must focus our attention on the artist's grasp of tools.

As science and technology advance at a hair-raising speed, the integration of science and technology with art has become a hot topic. Scientists and artists are exploring more ways of technology-art integration to enable new visual experiences. "The 14th National Art Exhibition for the first time integrated experimental art, digital art, and animation in one exhibition area, presenting the latest achievements in this field over the past five years" [3]. In fact, such integration does not necessarily bring efficiency to technology; instead, artists' pursuit of technological tools is determined by the inherent laws of artistic creation. Fundamentally, the higher efficiency enabled by technology is precisely to enable humans to have time to care about beauty. Efficiency is just the means, while it is beauty that comes as our ultimate goal.

As new technologies keep emerging, an increasing collection of new visual effects of artworks come into being. However, lots of artworks nowadays merely incorporate technological elements like sound, light, and electricity to satisfy the superficial desire for novel visual stimuli. These works are far from demonstrating cutting-edge technologies and have no profound aesthetic implications. When one, a scientist or an artist, wants to combine science and art, one must understand the laws of artistic creation. In fact, artistic creation is a personalized expression, and this personalization needs to be rooted in an individual's life experience. Scientists need to discover ways to express their attitudes through their research, shifting from the pursuit of the practicality of tools to the pursuit of the expressiveness of the subject's feelings. In the case of artists, they need to consciously maintain their position as the dominating part during art creation, treating special effects as expressive elements in their works rather than the ultimate goal. Therefore, when facing the issue of the combination of technology and art, we should not "blindly pursue the leading role of technology while neglecting the spiritual core of art. At the same time, we can utilize the avant-garde nature of art to endow technology with new concepts and imagination"[4].

In conclusion, technological art is still within the domain of "contemporary art" [5]. These constantly updated technological tools should not merely be regarded as materials to enrich the artistic effects of artworks, nor should they merely be seen as ways to showcase advanced technologies. Instead, we should incorporate them as an ordinary element when expressing specific ideas. Only in this way can technological tools truly participate in the artistic creation.

5. CONCLUSION

From Duchamp's ready-made products to the application of modern technology, the tools for artistic creation have become more diverse and personalized. Artists constantly explore new fields and forms of art through the creative use of these tools, driving innovation and development of art. The advancement of technology has greatly enriched artists' creative tools and methods, from digital technology to virtual reality to artificial intelligence. These emerging technologies not only provide unprecedented diversity for artistic creation, but also change the role of tools. In this transformation, technology provides opportunities and challenges for artistic creation, which requires in the artists not only technical literacy and innovative thinking, but also aesthetic and creative abilities to avoid misunderstandings, thereby enabling true technology-art integration and creating new and infectious works of art. Against the backdrop of technology-art integration, artists need to maintain their proactive position in art creation and inject new vitality and creativity into the development of art.

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PROCEEDINGS ARTICLE

Study on the Mechanism and Path of Digital Technology Enabling Agricultural Social Service Level Improvement

Yan Zhang[1] and Ge Wen[1,*]

[1]*Chengdu University of Information Technology, Chengdu, 610225, China*

[*]Corresponding author. Email: 1811975181@qq.com

Abstract

Utilizing digital technology to accelerate the improvement of agricultural social service levels is crucial for building a modern agricultural production system and achieving an organic connection between small farmers and modern agriculture. Currently, China's agricultural social services face a series of issues. Therefore, this paper, based on an analysis of their underlying mechanisms, proposes practical approaches such as establishing data integration and sharing mechanisms, accelerating the digital transformation and innovation of service providers, and strengthening the construction of rural digital infrastructure.

Keywords: Digital Technology; Agricultural Social Service Level; Mechanism; Realization Path

In the current context where "large countries with small farmers" remains a fundamental national and agricultural reality in China, agricultural social services have played a crucial role in facilitating the organic connection between small-scale farmers and modern agriculture. With the application and development of digital technologies in the agricultural sector, digitization has become one of the primary drivers of agricultural growth. Therefore, under the backdrop of the continuous integration of data elements and agricultural social services, studying the mechanisms and pathways through which digital technology empowers agricultural social services is of great importance for enhancing the level of agricultural social services.

1. THE REAL DILEMMA OF DIGITAL TECHNOLOGY ENABLING THE IMPROVEMENT OF AGRICULTURAL SOCIAL SERVICE LEVEL

1.1. Data Integration and Sharing is Difficult

Agricultural social services involve multiple stages and fields, with data sources being extensive and diverse in format, scattered across different departments, institutions, and systems, making integration challenging. The lack of unified data standards makes it difficult for systems to directly connect and share data, increasing processing complexity. At the same time, the severe phenomenon of information silos, where data barriers between departments and institutions hinder resource circulation and sharing, affects service coordination and efficiency. Moreover, agricultural services involve a large amount of personal information and sensitive data from farmers, and data breaches or misuse could result in incalculable losses. These issues collectively constrain the improvement of agricultural social service levels.

1.2. The Digital Transformation of Service Entities Lags Behind

Some service providers lack sufficient emphasis on digital technology and the drive for innovation, leading to slow digital transformation. At the same time, digital transformation requires substantial financial investment, which some service providers cannot afford due to limited funds, making it difficult to ensure the progress of the transformation. Moreover, there is a shortage of digital talent in the agricultural social services sector, causing service providers to face a talent bottleneck when introducing new technologies[1]. This lag not only restricts improvements in service quality and

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competitiveness but also weakens their innovation capabilities and market adaptability, making it hard for them to quickly respond to market demands and meet the diverse service needs of farmers, thus hindering the overall development of agricultural social services.

1.3. Weak Digital Infrastructure

Rural areas lag behind in digital infrastructure construction, with issues such as incomplete network coverage, unstable signals, and low bandwidth being prominent. This affects farmers' timely access to agricultural information and technology. Due to the backward economic conditions and low population density in rural areas, operators face high risks when investing in rural digital infrastructure, leading to a lack of enthusiasm. As a result, the progress of rural digital infrastructure construction is slow, and existing facilities are inadequately maintained. This further exacerbates the weak state of digital infrastructure, severely limiting the application and promotion of digital technologies in agricultural social services.

2. ANALYSIS OF THE MECHANISM OF DIGITAL TECHNOLOGY ENABLING THE DEVELOPMENT OF AGRICULTURAL SOCIAL SERVICES

Digital technology not only provides a new idea for solving the problems in traditional agricultural services, but also injects a strong impetus to promote the comprehensive transformation and upgrading of socialized agricultural services services. The following will explain its internal mechanism from four aspects, and reveal how the digital technology has become the key force to drive the agricultural socialization service towards the modernization and intelligence.

2.1. Break the Data Barrier and Realize Efficient Allocation of Resources

By establishing unified data platforms such as big data centers and cloud computing systems, centralized storage and standardized management of data from various departments can be achieved. Standardized digital technology processes ensure uniform data formats, enabling smooth cross-system integration and breaking down data silos. The introduction of blockchain and smart contract technologies provides a trustworthy environment for data security, while smart contracts clarify data usage rights and benefit distribution[2]. This decentralized data sharing model enhances data utilization efficiency, strengthens trust and cooperation among participants, and offers solid support for the coordinated development of agricultural social services.

2.2. Drive the Intelligent Upgrading of Service Entities and Enhance Their Competitiveness

Digital technology brings new impetus for the intelligent upgrade of agricultural social service entities. IoT technology collects real-time data from farmland, enabling smart control and improving efficiency, quality, and resource utilization. AI technology mines agricultural data to provide precise decision-making, optimizing supply chains and marketing [3]. Digital technology is widely applied in multiple fields such as agricultural finance, information, and technology, providing producers with convenient financing, market dynamics, technical support, simplifying procurement, enhancing mechanization, achieving smart supervision, and expanding sales. These measures enhance the competitiveness of service entities, improve market adaptability, and inject new momentum into the high-quality development of agricultural social services.

2.3 Improve Digital Infrastructure and Consolidate the Foundation for Technology Application

Digital infrastructure is the foundation for empowering agriculture with digital technology. Robust facilities enable high-speed network connections, ensuring rapid data transmission and real-time interaction. 5G technology offers high bandwidth and low latency, supporting intelligent management applications such as [4]. The construction of the Internet of Things provides a platform for agricultural data collection, with sensors collecting key data like soil conditions in real time. Big data centers deeply mine and analyze this data, providing scientific decision support for agricultural production. Strengthening the development of digital infrastructure can break through bottlenecks in rural digital technology applications, promote the digital transformation of agricultural social services,

achieve precise management of agricultural production, and enhance agricultural efficiency and benefits.

3. PRACTICAL PATHS FOR IMPROVING THE LEVEL OF AGRICULTURAL SOCIALIZATION SERVICES BY DIGITAL TECHNOLOGY

3.1. Establish a Data Integration and Sharing Mechanism

The government should lead in establishing unified data standards and norms, building an agricultural big data platform as the core carrier to integrate various agricultural data resources. This will enable centralized storage, management, and analysis of data, providing comprehensive data support for socialized agricultural services. The aim is to enhance the precision and efficiency of agricultural production, facilitating the transformation and upgrading of the agricultural industry. At the same time, the government should encourage enterprises and research institutions to actively participate in data sharing, stimulating their enthusiasm through policy guidance and financial support. To ensure data security, it is necessary to strengthen management and supervision, clarify responsible entities, and develop management measures and emergency response procedures to prevent data from being leaked, tampered with, or misused during the sharing process[5]. The establishment of this mechanism will strongly promote the development of socialized agricultural services, providing solid data support for agricultural modernization.

3.2. Promoting the Digital Transformation and Innovation of Service Entities

Service entities should enhance their digital awareness and proactively seek digital transformation and innovation. The government should introduce preferential policies to ensure the technical upgrades of service entities and reduce transformation costs. Service entities should collaborate with universities and research institutions to develop digital technologies, conduct application demonstrations, and explore digital service models. At the same time, they should prioritize the cultivation and recruitment of digital talent to provide intellectual support for transformation. Encourage service entities to innovate, exploring new models such as precise big data services and intelligent management, to improve service efficiency and quality, and enhance market competitiveness. Through these measures, promote the continuous innovative development of agricultural social services to meet the new requirements of the digital age.

3.3. Strengthening the Construction and Upgrading of Digital Infrastructure in Rural Areas

It is necessary to accelerate the construction of digital infrastructure such as 5G base stations and big data centers in rural areas, addressing issues like incomplete network coverage and unstable signals, to improve information transmission efficiency. The government should collaborate with social capital, sharing risks and benefits, and formulate policies to encourage investment from social capital. By adopting public-private partnerships, the pressure on construction funds can be alleviated. At the same time, it is essential to establish a robust maintenance management system for rural digital infrastructure, enhancing facility inspections and maintenance, promptly identifying and resolving faults to ensure stable operation of facilities[6]. This will guarantee a good internet experience for farmers, provide a solid foundation for rural digital development, and promote the modernization of agriculture.

4. CONCLUSIONS

This article explores the mechanisms and pathways through which digital technology enhances agricultural social service levels, highlighting that digital technology is a key driving force. However, the widespread application of digital technology in agriculture faces challenges. To fully leverage its potential, it requires joint efforts from the government, social organizations, and service providers. Measures such as establishing data sharing mechanisms, promoting the digital transformation of service providers, and strengthening rural digital infrastructure construction are needed to better improve agricultural social service levels and inject new vitality into agricultural modernization.

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PROCEEDINGS ARTICLE

Research on the Development of Skills-Based Talent in Equipment Manufacturing Industry

Mingli Wang[1]

[1]*Liaoning Inspection Examination and Certification Center, Shenyang, 110004, China*

*Corresponding author. Email: 15524027479@163.com

Abstract

The equipment manufacturing industry is a foundational and strategic industry that provides technical equipment for various industries of the national economy. It is a strong guarantee for industrial upgrading and technological progress. The team of technical workers is the important foundation for supporting Made in China and Created in China. Building a large army of skilled workers is of great significance for promoting and strengthening the development of equipment manufacturing industry. Although in recent years, China has strengthened policy supply, optimized the guarantee mechanism, and actively built a high-skilled talent team for the industry, there are still problems in the training, evaluation, service, and management of workers, and the quality of skilled workers is generally not suitable for the needs of the development in the manufacturing industry . Therefore, we should strengthen the construction of skilled talent teams in equipment manufacturing industry from promoting industrial development and upgrading, improving policy measures and organizational mechanisms for skilled talent, perfecting the training of industrial skilled talent, and the optimization and management of industrial skilled talent, so as to provide a solid talent support for Industrial development.

Keywords: Equipment Manufacturing Industry; Skilled Talent; Problems; Countermeasures

The equipment manufacturing industry is a strategic industry that provides technical equipment for various industries of the national economy. It has a high degree of industrial relevance, employment absorption capacity, and is technology and capital-intensive. It is an important guarantee for the industrial upgrading and technological progress of various industries and a concentrated reflection of the country's comprehensive strength. China's equipment manufacturing industry, as an important pillar of the national economy, has made significant progress in terms of scale, technology, and industrial chain in recent years, and the level of equipment manufacturing is gradually developing towards high-end. The report of the 20th National Congress the Communist Party of China has elevated masters and highly skilled talents to the national strategic talent level. General Secretary Xi Jinping points out “The technical workforce is an important foundation for China's manufacturing and innovation, and plays an important role in promoting high-quality economic development”. Therefore, focusing on the urgent needs of industrial upgrading and high-quality development of enterprises, and striving to strengthen the construction of skilled talent teams in the equipment industry, is of great significance.

1. THE CURRENT SITUATION OF THE DEVELOPMENT OF SKILLED TALENTS IN THE EQUIPMENT MANUFACTURING INDUSTRY

In recent years, China has actively promoted the high-quality development of the equipment manufacturing industry, created a good industrial development environment, and improved talent attraction and retention development environment. Such documents have made top-level design and planning for industrial development, and a series of measures have been introduced to increase support in terms of finance taxation, technological innovation, industrial upgrading and transformation, and

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internationalization. China is accelerating its transition from a big equipment country to a strong equipment country. The output value of China's equipment manufacturing industry has been the highest in the world for many years, accounting for about 30 percent of the global total.

Meanwhile, policy supply is strengthened, and the guarantee mechanism is optimized to actively create high-skilled personnel team for the industry. By 2023, the total number of skilled workers in the equipment manufacturing industry exceeded 50 million, accounting for more than 35% of the skilled workers in the manufacturing industry, of which the proportion of high-skilled talents (senior worker and above) was about 28%, lower than that of Germany (40%) and Japan (35%). In terms of industry distribution, the supply of basic occupations such as Welding and CNC machine tool operation in traditional fields is relatively sufficient, but the aging is serious, with more than 60% of the workers over 40 old. The demand for emerging fields such as industrial robot operation and maintenance, intelligent manufacturing system integration, and new energy equipment commissioning is prominent, with a gap of 3 million in 2023. In terms of regional distribution, the talent clustering effect in the Yangtze River Delta and the Pearl River Delta is significant accounting for more than 50% of the country, while the Northeast, Central and Western regions have difficulty in recruiting workers.

2. PROBLEMS IN THE DEVELOPMENT OF SKILLED TALENTS IN THE EQUIPMENT MANUFACTURING INDUSTRY

2.1. The Quality of Skilled Talents Does Not Meet the Needs of the Development of Manufacturing Industry

The traditional industry has a large number of talents, while the strategic emerging industries have a shortage of talents, especially in the high-tech industries such as high-end equipment manufacturing, new materials, and aerospace, which are key development industries. There is a gap of 3 million people in the posts of industrial robot maintenance, intelligent manufacturing system integration, and new energy equipment commissioning in 2023. The phenomenon of shortage of skilled talents is more serious, especially the lack of academic leaders with international vision and mastering of international core technology. From the perspective of the workforce, there are more junior technicians, fewer senior technicians, more traditional, fewer modern technicians, more technicians with single skills, and fewer composite technicians.

2.2. The Government Also Needs to Further Improve the Mechanism for Promoting

Although a series of documents have been issued successively, the measures taken by local government departments to introduce, retain and train skilled talents are largely the copy application of relevant national policies, and the measures reflecting regional characteristics and features are relatively insufficient. There are not many measures focusing on the characteristics and trends of regional industry development, the degree of emphasis on skilled talents is not high. The corresponding safeguard measures and incentive measures are also not perfect. There is little contact between the education department, universities and enterprises. There is a lack of collaborative mechanism and relevant contact platform.

2.3. The System of Skills-Based Talent Training is Not Perfect Enough

Although China has been deepening the integration of industry with education, and has adopted innovative practices in terms of school-enterprise cooperation, vocational education, and major setting, on the whole, the development and training of skilled talent teams are not closely integrated with enterprises.The training orientation is inaccurate, and training characteristics are not distinct. The updating of teaching content and personnel training models is lagging behind, and traditional teaching is still the main method, which fails to meet needs of enterprises for industrial transformation and upgrading in the new era, and lacks professional job skills. It is difficult for enterprises to recruit skilled talents who meet the job requirements the first time, and they generally need to be trained internally, increasing the labor cost of enterprises. At the same time, enterprises have not established an effective system for training of skilled talents.The training investment is insufficient, and the training methods are also relatively single, lacking a planned and organized training model.

2.4. The Evaluation System for Skilled Talent Needs to be Further Improved

According to the research surveys, many enterprises reflect that although the job level development system and the skill talent evaluation scheme have been established, the implementation is at a standstill or in the early stage of basic work, and there is no dynamic management. At the same time, because the processes involved in the production and of enterprise products are complicated and there are many types of skill positions, a huge job recognition system is needed to evaluate each skill type professionally, which is undoubtedly a great challenge for the existing job level evaluation system of enterprises. Many enterprises are powerless in the professional evaluation of skilled talent, and it is difficult to make a fair and objective evaluation of each type of work from a professional perspective.

2.5. The Employment Service System and Vocational Qualification Assessment for Skilled Workers are Not Perfect Enough

At present, most of the equipment manufacturing schools in colleges and universities in various places cooperate with enterprises, which can guarantee a certain rate of employment. Overall, there is a lack of perfect employment service system, and there are few service sites in industrial parks, enterprises, colleges and universities. The aggregation and leading effect of labor models and craftsmen at all levels are insufficient, and the precise service supply for multi-subjects such as small and medium-sized enterprises, voc colleges (technical colleges), on-the-job workers and vocational education students is limited, which makes it difficult to allocate suitable talents to the most suitable posts. At the same time, there is a disconnection between education and training and qualification certificates, and qualification certificates and enterprise employment requirements, which fails to form an effective connection in the work of enterprise selection and skilled talent selection.

2.6. The Economic Treatment and Social Status of Skilled Talents are Not High Enough

Due to the influence of education, professional title, seniority and identity, the remuneration of skilled talents is generally low compared with of high-level professional and technical personnel in enterprises. The remuneration system and incentive mechanism are still not sound. Due to the control of the total remun and the influence of the existing wage structure, it is difficult for skilled talents to match their remuneration, incentives and related benefits with the existing remuneration system they are promoted. At the same time, the social concept of "emphasizing education and neglecting ability; emphasizing equipment and neglecting technicians; emphasizing theory and neglecting operation”is still deeply rooted, and the attractiveness of skill employment and skill development for young people is insufficient, and the social recognition of technicians is insufficient. Many employees surveyed in the enterprises said that "the income is not high, the social status is low, and the sense of identity is not strong".

3. COUNTERMEASURES FOR THE DEVELOPMENT OF SKILLS-BASED TALENTS IN THE EQUIPMENT MANUFACTURING INDUSTRY

3.1. Under the Government’S Guidance, Improve Policy Measures and Organizational Mechanisms for Skilled Talent

First, reasonably position and formulate supporting policies. Carry out an all-round analysis of the foundation and trend of the development of the equipment manufacturing industry, draw on the experience and achievements of the development of skilled talents in domestic and foreign industries, adhere to the long-term development goals, further formulate and issue guiding documents at the national and provincial levels, and introduce support policies for high-quality and distinctive development of technical education. The demand in key fields such as advanced manufacturing industry and strategic emerging industries should be well aligned. A number of cutting-edge specialties should be built, and the measures for the cultivation, evaluation, use, incentive and security of skilled personnel in the equipment manufacturing industry should be improved. These will promote the development of the quality, scale and of skilled personnel in line with that of new productive forces.

Second, integrate all kinds of resources to form a joint force. The development of skilled personnel in the equipment manufacturing industry requires the organization and leadership multiple

government functional departments such as the Provincial Development and Reform Commission, the Provincial Industry and Information Technology Department, the Provincial Education Department, the Provincial Science and Technology Department, and will also involve enterprises, universities, research institutes, and industry associations. Therefore, to achieve overall layout and control, integrate the strength and resources of all parties, and further explore effective models. It is necessary to establish a "global, normalized, diversified, and effective" working of all parties. Establish relevant coordination mechanisms, establish industry-education linkage platforms, and build a number of high-level composite talent training and practice bases around industrial and supply chains, so as to promote the integration and development of talents training and use among large, medium, small, and micro manufacturing enterprises.

Third, create a good social orientation. The government should form a mainstream consciousness in society that "technical talents are also talents, and skilled workers are also important human resources", ensure that skilled workers become respected professions, highlight the "high, precise, cutting-edge and scarce" orientation, comprehensively strengthen the service guarantee for leading talents in high-skills, and improve the political treatment, economic treatment and social treatment of leading talents in high-skills. Vigorously promote the spirit of labor model and craftsmanship, make full use of mainstream media, mobile Internet and new media to tell good stories of labor model and craftsmanship well, and create a social atmosphere in which labor is glorious, skills are precious, and creation is great. Create a social fashion in which labor is glorious a work style in which excellence is pursued.

Fourth, improve the mechanism for increasing financial input. Implement and improve the subsidy policies for vocational training and skills assessment, gradually increase proportion of vocational training subsidy expenditure, and include the construction fund for high-skilled talent teams in the budget for local government talent work. Raise funds through channels, and establish a financial input system that is compatible with the school operation model and training requirements, focusing on supporting the implementation of the construction plans for demonstration (back) schools, high-quality characteristic schools, key specialties, internship and training bases, “dual-qualified” teacher teams, and information technology. The provincial finance may grant comprehensive awards and subsidies based on the actual investment in vocational education and the results of performance evaluation in various places.

3.2. Demand Oriented, Perfect the Training of Industrial Skilled Personnel

First, talent training should be based on the needs of new-era regional industry transformation and upgrading. We should always focus on adapting to the-environment of economic and social development and the transformation and upgrading of regional industries, take the development needs of advanced equipment manufacturing industry as the guide, understand the needs regional industries from the aspects of supply quantity, quality and structure, further determine the goals of talent training, promote the connection between major settings and industry needs, curriculum content professional standards, and teaching process and production process. Promote the effective connection of manufacturing industry chain, entrepreneurship chain and training chain, focus on strategic industries such as advanced equipment manufacturing, fine chemical industry, and metallurgical new materials, and establish a talent supply chain that integrates recruitment training, employment, and improvement, cultivate a skill talent industry chain, and focus on the training of high-skilled talents and urgently needed talents, and accelerate expansion of the skill talent team.

Second, establish and improve a modern vocational education system that meets the needs of industry for skilled talent. Establish a-level and multi-pronged pattern for training in vocational education, in which the government plays a leading role, enterprises are the main participants, vocational are the main focus, cooperation between enterprises and schools is the foundation, and social sectors including industry associations are widely involved. Explore establishing vocational education groups that the entire industrial chain, and suggest that vocational schools and enterprises establish coordination mechanisms, set up relevant majors and educational resources in the schools that keep pace with those in the enterprises, and create a linkage pattern in which vocational education is biased toward the needs of the enterprises, and establish professional systems and dynamic adjustment mechanisms that suited to the needs of advanced manufacturing, modern services, and strategic

emerging industries and more. Implement a system of integration of industry with education and cooperation between enterprises schools, and actively practice the apprenticeship teaching mode of "cooperation between enterprises and schools, and alternation of work and study". Give full to the main role of enterprises, and support enterprises to independently carry out training projects such as new apprenticeship training and technician training, and implement training subsidy policies.

Third, improve the vocational training system for skilled personnel. Great efforts should be made to carry out employment skills training, job skills training, and entrepreneurship training. Efforts should also be made to strengthen the construction and services of the public service platform for education management, so as to achieve the connection and sharing of data and information among schools, enterprises and society. Promote the construction of public vocational training bases at different levels. High-level vocational training bases that integrate vocational education, public training, research and study, contest training, skills evaluation, and employment services should be established in higher vocational schools and technical schools. A number of professional talent training bases that integrate industry with higher education, research and study, and application should be built in general universities, higher technical, manufacturing enterprises, industrial parks, and makerspaces. The construction of the “Internet+ ” training platform should be strengthened, and the “Internet vocational skills training should be popularized. A unified skills training and evaluation management information system with registered management for every province and an electronic file of lifelong vocational skills training for workers should be established.

3.3. Optimize Management, Strengthen the Support and Guarantee for the Construction of Skilled Talent in Industries

First, a system that links skill levels to pay grades should be established. A wage distribution mechanism based on job value, competency and performance should be established, focusing on “more pay for higher skills, more pay for more work”. Enterprises should make personalized settings for the use of funds, resource support and research performance in scientific research projects according to actual conditions.The assessment and fulfillment should be unlimited at the top and guaranteed at the bottom.

Second, a diversified incentive mechanism should be established. Fully leverage the excellent new product awards of our county and every province, focusing on rewarding individuals teams that have made outstanding contributions to the development of industrial technology, especially in emerging industries. For skilled talents who have made outstanding contributions in the transformation of high-tech, creating significant economic or social benefits, the government will grant generous rewards. Guide employers to explore implementing incentive measures such as project-based salaries, position dividends special rewards, and equity participation in technological innovation results for high-skilled talents, and clarify that high-skilled talents at all levels will enjoy the same treatment professional and technical personnel at corresponding levels.

Third, further strengthen the staffing services for equipment manufacturing enterprises. It is necessary to improve the normalized service mechanism for the staffing of key enterprises, as well as the coordination between the labor-intensive areas and the labor-exporting areas. For some key enterprises with strong employment-driving ability and large staffing scale， it is necessary to establish a public employment service contact system, set up employment service specialists, and implement fixed-point services. It is possible to try to carry out recruitment, find out the staffing needs of key enterprises in advance, and customize exclusive live broadcast plans for each enterprise.

Fourth, carry out international cooperation and exchanges of industrial skilled personnel. Organize industrial skilled personnel to actively participate in the implementation of the strategy going out and the construction of the national "Belt and Road", strengthen international skills exchanges, implement special training plans for skilled personnel, select excellent high-sk personnel to go abroad (overseas) for skills training, and cultivate high-skilled leading talents with international vision in the industry. At the same time, should also attract foreign large enterprises, carry out various forms of international cooperation of skilled personnel, and use the resources of skilled personnel in other countries to enrich and inspire the experience of skilled personnel.

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PROCEEDINGS ARTICLE

Research on the Improvement of Teachers' Digital and Artificial Intelligence Literacy under the Background of the Establishment of Multidisciplinary Interdisciplinary Talent Training System

Tan Xu[1] and Wei Li[2,*]

[1]*Humanities and Social Sciences, Harbin Engineering University, Harbin, 150001, China, kyotann2602@yahoo.co.jp;*
[2]*School of International Studies, Harbin Institute of Technology, Harbin, 150001, China;*

[*]Corresponding author. Email: *rii217@163.com*

Abstract

The promulgation of the standard "Teachers' Digital Literacy" is of far-reaching significance. Its goal is to encourage teachers to improve their comprehensive abilities in an all-round way in the digital age, so that they can skillfully use digital technology to optimize, innovate and change education and teaching activities. At present, colleges and universities shoulder an important mission, and it is necessary to explore practical and effective measures and methods to comprehensively improve teachers' overall digital literacy. The purpose of this paper is to study how to deal with the challenges and opportunities brought by the digital age and the rapid development of artificial intelligence technology to the field of education, and to improve teachers' digital and artificial intelligence literacy through in-depth discussion and practice, so as to optimize educational and teaching activities and promote educational innovation and development.

Keywords: Digital Age; Artificial Intelligence Technology; Teachers' Digital Literacy; Education and Teaching

1. INTRODUCTION

In recent years, artificial intelligence technology has developed rapidly, especially generative artificial intelligence has swept the world, and the field of education has ushered in unprecedented changes and opportunities. In this context, in order to enhance teachers' awareness, ability and responsibility to use digital technology to optimize, innovate and transform educational and teaching activities, the Ministry of Education issued "Teacher Digital Literacy" on November 30, 2022, and implemented it on the same day **[1]**. Under the background of "improving teachers' digital and artificial intelligence literacy", how to improve teachers' digital and artificial intelligence literacy has become an urgent topic for colleges and universities. In view of this "topic", this article discusses from the following aspects, hoping to provide practical and effective measures, methods and positive and valuable suggestions for colleges and universities to comprehensively improve teachers' overall digital and artificial intelligence literacy.

2. N-DEPTH INTERPRETATION AND ANALYSIS OF TEACHERS' DIGITAL LITERACY

"Teacher Digital Literacy" is an education industry standard issued by the Ministry of Education to promote educational modernization and the deep integration of information technology in the field of education. This standard clarifies the framework of teachers' digital literacy, and clarifies the digital literacy that future teachers should have from five dimensions [2] , namely:

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2.1. Digital Awareness

Digital awareness is the foundation of teachers' digital literacy. Teachers need to have a forward-looking vision, be able to foresee and adapt to these changes, and actively learn and master digital technology to meet the challenges of future education [3] .

2.2. Digital Technology Knowledge and Skills

Knowledge of digital technology is the basis for teachers to master digital technology. It requires teachers to understand the concepts and basic principles of some common digital technologies, such as the connotation characteristics of big data, artificial intelligence, virtual reality and other technologies, as well as their procedures and methods in solving problems. This knowledge helps teachers to better understand the essence and application scenarios of digital technology, and provides strong support for the application of digital technology. For example, teachers need to choose appropriate digital teaching equipment, software or platform according to education and teaching application scenarios and teaching needs; At the same time, it is also necessary to be able to skillfully use these devices, software and platforms to carry out educational and teaching activities and solve common technical problems [4] .

2.3. Digital Applications

Digital application requires teachers to analyze learning situation, obtain and manage digital educational resources, design digital teaching activities and create mixed learning environment. For example, teachers can use intelligent terminal devices to support the effective organization and management of teaching activities; Improve teaching links based on student feedback through online teaching activities; Use digital technology to support individualized teaching, etc.

2.4. The Dimension of Digital Social Responsibility

Digital collaborative education is a process in which teachers use digital technology resources to realize home-school co-education and promote students' all-round development. Among them, the moral code of rule of law is the basic code of conduct of teachers in the digital society. These codes of conduct help to maintain the clarity and order of cyberspace and promote the healthy development of digital education.

2.5. Professional Development Dimension

In the digital age, teachers need to establish the concept of lifelong learning, constantly track the frontier of educational technology, update educational ideas and teaching methods to meet the needs of educational reform and development. For example, teachers can use multimedia teaching tools to create teaching situations; Use online platforms to organize cooperative learning; Use data analysis tools to evaluate students' learning effectiveness, etc.

3. EFFECTIVE MEASURES AND METHODS FOR COLLEGES AND UNIVERSITIES TO IMPROVE TEACHERS' OVERALL DIGITAL AND ARTIFICIAL INTELLIGENCE LITERACY

Teachers are the core of talent training in colleges and universities. Therefore, colleges and universities should make efforts in the following aspects.

3.1. Strengthen the Construction of Hardware Infrastructure

Hardware facility guarantee is the fundamental guarantee for improving the overall digital and artificial intelligence literacy of college teachers. Therefore, colleges and universities should increase capital investment in the purchase of hardware facilities, and equip corresponding technical personnel while purchasing equipment. In addition, colleges and universities can also conduct in-depth cooperation with science and technology enterprises, master the information of the latest hardware facilities, invite science and technology enterprises into the campus, explain the use of the latest hardware to teachers, and provide teachers with all-round practical opportunities.

3.2. Strengthen the Construction of Teacher Training System

As each university has its own actual situation, when improving teachers' digital and artificial intelligence literacy, colleges and universities should first combine their own actual situation, analyze their advantages and disadvantages in digital literacy cultivation, design specific plans, and strengthen the construction of teacher training system. For example, offer systematic digital literacy courses, covering digital technology applications, online teaching methods, etc.; Set up artificial intelligence training workshops and invite industry experts to give lectures and guidance, so that teachers can have an in-depth understanding of the application scenarios and potential of artificial intelligence in education; At the same time, build a digital teaching practice platform, encourage teachers to actively participate, and transform theoretical knowledge into practical teaching ability; Furthermore, establish an incentive mechanism to commend and reward teachers who have performed well in improving digital literacy, and stimulate teachers' enthusiasm and initiative [5] .

3.3. Build an All-Round Teaching and Research Community

Integrating digital literacy training into teachers' daily teaching and scientific research work and forming a normalized promotion mechanism is the best way to improve the overall digital and artificial intelligence literacy of college teachers. Therefore, building a cross-school, cross-regional, and interdisciplinary teaching and research community, allowing artificial intelligence to provide teachers with a high-quality educational platform and become an advanced teaching tool is the only way to build an all-round teaching and research community. For example, schools can invite relevant information technology personnel to develop artificial intelligence courses and learning resources suitable for teachers, including teaching materials, case libraries, online learning platforms, etc., and strengthen the co-construction of collaborative knowledge bases by praising schools, cross-regional, interdisciplinary and other ways, focusing on cultivating students' ability to comprehensively use multi-disciplinary knowledge to solve problems in different situations, making teaching methods more flexible and teaching horizons wider. Students can "listen" to the lectures of big coffee makers from a long distance.

3.4. Incorporate Teachers' Digital and Artificial Intelligence Literacy into the Teacher Assessment System

In order to better implement and improve teachers' digital and artificial intelligence literacy and encourage teachers' continuous exploration and practice in the field of digital and artificial intelligence, colleges and universities should incorporate teachers' digital and artificial intelligence literacy into the year-end teacher assessment standards. For example, colleges and universities can consider giving extra points to teachers who perform well in the fields of digital and artificial intelligence when evaluating and selecting key teachers; In professional title evaluation and professional development evaluation, the weight of teachers' digital and artificial intelligence literacy can be added.

4. THE NECESSITY OF IMPROVING TEACHERS' DIGITAL AND ARTIFICIAL INTELLIGENCE LITERACY

The rapid development of digital technology and artificial intelligence is quietly changing the pattern of higher education in China. Actively promoting the integration and development of education and teaching, digital technology and artificial intelligence, and improving teachers' digital and artificial intelligence literacy are inevitable requirements for college education. This paper will take the integration of "Northeast Anti-Alliance Spirit" into the ideological and political content of the curriculum and the construction of a "multidisciplinary interdisciplinary talent training system" as examples to fully expound the necessity of improving teachers' digital and artificial intelligence literacy.

4.1. "Northeast Anti-Alliance Spirit" is Integrated into the Ideological and Political Content of the Curriculum and the Application of Artificial Intelligence

As the earliest anti-Japanese armed force with the most difficult conditions and the longest duration under the leadership of the Communist Party of China (CPC), the Northeast Anti-Japanese Allied Forces experienced the longest and most tragic 14-year anti-Japanese struggle. The Northeast

Anti-Alliance Spirit is the representative of the indomitable national spirit of the Chinese people to resist Japanese aggression, the precious wealth of the Chinese nation, and the important content of the ideological and political curriculum. Making full use of and giving full play to the advantages of digital technology and artificial intelligence, and integrating the spirit of the Northeast Anti-Alliance into the ideological and political education of colleges and universities more vividly and vividly, will undoubtedly publicize and carry forward the spirit of the Northeast Anti-Alliance and deepen patriotic education. It will bring the greatest benefits. This requires college teachers to have good digital and artificial intelligence literacy.

In the history of War of Resistance against Japan, China, the Northeast Anti-Japanese Alliance is an eternal topic. With the collation and in-depth excavation of literature and historical materials, China has accumulated a large number of fruitful research results in the research field of Northeast Anti-Japanese Alliance. Making full use of digital and artificial intelligence technologies to show these rich achievements vividly and vividly to students in the classroom is the best way for students to have a deep understanding of the Northeast Anti-Union soldiers who surpass human limits, serve difficulties and obstacles in customer service, and resist foreign invasion bravely and unyielding. It is also the best way to publicize and carry forward the Northeast Anti-Union spirit and carry forward patriotism. For example, in 2021, the big data construction project of the Northeast Anti-Japanese Alliance Historical Facts Exhibition Hall was launched. The project scanned 200GB of propaganda works about the historical facts of the Northeast Anti-Japanese Alliance, produced 45GB of two-dimensional videos, and produced 10 issues of red anti-Japanese alliance stories; At the same time, the Northeast Anti-Union Historical Facts Exhibition Hall has completed the establishment of cultural resource classification data set on the bottom association inheritance system of the national cultural big data system, imported data materials such as panoramic photos and 3D modeling of six exhibitions, and obtained ISLI codes [6] . Teachers in colleges and universities can "find" the above information through big data, and show the above information to students in class through digital and artificial intelligence technologies, so that students can be there, feel the real situation of the Northeast Anti-Union fighters resisting foreign invasion, perceive the indomitable heroic spirit of the Northeast Anti-Union fighters who are not afraid of sacrifice, have a deeper understanding of the greatness of the Northeast Anti-Union spirit, and truly see the outstanding contribution made by China under the leadership of the Communist Party.

4.2. Construct a "Multidisciplinary Interdisciplinary Talent Training System" and the Application of Artificial Intelligence

Today, with globalization and increasingly frequent international exchanges, the cultivation of young talents with "international competence" is a new requirement for colleges and universities. In the new era of building Community of Shared Future for Mankind and developing new productive forces, college education should cultivate "multidisciplinary interdisciplinary talents" with national feelings, global vision, ability to expand cultural communication, and ability to solve complex interdisciplinary problems. This requires better integration of various resources in different disciplines, strengthening the mutual penetration and intersection of disciplines by breaking the boundaries of disciplines, and fully blending the ideas of various disciplines. Artificial intelligence and digital technology just meet the needs of the "multi-disciplinary interdisciplinary talents" training system. This requires teachers to have certain digital and artificial intelligence literacy. For example:

First, in the design and optimization of the multi-disciplinary cross-curriculum system, teachers are required to make use of digital and artificial intelligence technologies, achieve advanced layout, integrate existing curriculum resources, and build a comprehensive curriculum system covering multi-disciplinary fields while avoiding simple superposition of curriculum content, so as to realize the organic integration of multi-disciplinary courses with professional courses as the mainstay.

Secondly, in terms of innovative teaching methods and means, teachers are required to make full use of digital and artificial intelligence technologies to explore methods suitable for interdisciplinary teaching. For example, through project-based learning, problem-oriented, team collaborative learning, etc., students' foreign language application ability can be improved, and the core value elements of national feelings can be integrated into the whole process of training, so that students can not only have

cross-cultural communication skills, but also master the most cutting-edge international development trends, enhance students' leadership, and stimulate students' learning interest and innovation ability.

Thirdly, in terms of strengthening practical teaching, teachers are required to make full use of digital and artificial skills, establish interdisciplinary practical teaching platforms efficiently and quickly, and make good use of international and domestic platforms to carry out comprehensive practical projects, such as: (1) Increase internship opportunities: recommend students to practice in multinational enterprises, government departments, foreign-related institutions, etc.; (2) Increase international exchange programs and actively build international exchange platforms: organize students to visit international organizations and academic institutions for short-term visits and exchanges, and attend international academic conferences; (3) By simulating and solving relevant international dispute cases, improve students' relevant skills in handling international affairs, and cultivate students' ability to solve practical problems and interdisciplinary practical skills.

5. CONCLUSION

With the development of digital technology and artificial intelligence, learning is no longer limited to traditional classrooms. Intelligent platforms and interdisciplinary and cross-regional learning have become new trends in teaching and scientific research in colleges and universities. This paper starts with an in-depth interpretation and analysis of Teachers' Digital Literacy promulgated by the Ministry of Education, and elaborates on the effective measures and methods to improve teachers' overall digital and artificial intelligence literacy in colleges and universities. Taking the integration of the "Northeast Anti-Alliance Spirit" into the ideological and political content of the curriculum and the application of artificial intelligence, the construction of a "multidisciplinary interdisciplinary talent training system" and the application of artificial intelligence as examples, this paper analyzes in detail the necessity of improving the digital and artificial intelligence literacy of college teachers. Under the background of the establishment of a multidisciplinary interdisciplinary talent training system, it is expected that the discussion in this article can provide a positive and useful reference for colleges and universities to improve teachers' digital and artificial intelligence literacy.

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PROCEEDINGS ARTICLE

Current Status, Challenges, and Breakthrough Paths in the Construction of Dual-Qualified Teacher Teams in Guang dong Private Higher Vocational Colleges Driven by the Digital Economy

Yazhi Zhang[1,*] and Jing Wang[2]

[1]*Huizhou Economics And Polytechnic College, Huizhou, 516057, China;*
[2]*City College Of Huizhou, Huizhou, 516025, China; 114139974@qq.com*

[*]Corresponding author. Email: 469301869@qq.com

Abstract

In the digital era, there is an urgent need for interdisciplinary, high-quality technical and skilled talents. The cultivation of such high-caliber professionals relies on high-level "dual-qualified" teachers. Based on a survey and analysis of 12 private higher education institutions participating in the "Innovation-Driven School Development Project," this study utilizes digital technologies to reconstruct effective pathways and supporting measures for building dual-qualified teacher teams in Guangdong's private higher vocational colleges. This reconstruction is conducted across seven dimensions: organizational structure, cultivation mechanisms, talent recruitment, competitive systems, performance evaluation, incentive strategies, and resource safeguards.

Keywords: Digital Economy; Private Vocational Colleges; "Double-qualified" Teacher

1. FOREWORD

As the digital economy has become the core engine of global economic growth, it is reconstructing the education ecology, supported by big data, artificial intelligence, blockchain and other technologies. Vocational education, as the main position of skilled personnel training in the era of digital economy, is urgent to realize connotative development through the digital transformation of teachers. The construction of "double-qualified" teachers is crucial to improving the quality of vocational education and enhancing the ability of vocational colleges to serve regional economic and social development, and is the key starting point of vocational education reform.Based on this, the further study of digital economy era of Guangdong private vocational colleges "double" teachers team construction difficulties and path breakthrough, not only for Guangdong private vocational colleges provide operational reform Suggestions, help its accurate docking "a large bay area of Guangdong" digital economy industry cluster talent demand, also can provide reference for the national vocational education high quality development and reference.

2. REVIEW OF DOMESTIC AND FOREIGN RESEARCH STATUS, TOPIC SELECTION BACKGROUND AND SIGNIFICANCE

2.1. Review of Domestic and Foreign Research Status

2.1.1. Research on Digital Transformation at Home and Abroad

Digital transformation is an important measure and an effective way to promote the high-quality development of the Chinese economy. In order to fully understand the research and progress of digital transformation at home and abroad, take the theme of digital transformation included in the China

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National Knowledge Network (CNKI) database from 2000 to 2024 as the research object, and the scientific knowledge graph software CiteSpace is used to sort out the research process of digital transformation in China, and conduct visual analysis as shown .It is found that the research of digital transformation in China is increasing rapidly; the cooperation between authors and research institutions needs to be strengthened; the research focus mainly includes digital publishing, enterprise management, industrial Internet, manufacturing, newspaper, publishing and so on. After experiencing the road of digital transformation from traditional industry to modern industry, China's digital transformation has entered a period of great development. According to the literature data search, the research on digital transformation by domestic scholars was first published in 2000[1], which opened the door to the research on digital transformation in China. As can be seen from the number of articles posted on digital transformation, it is closely related to the guidance of digital transformation policies, the rapid development of digital technology and the promotion of specific application in China in the past decade.

From the perspective of the definition of the concept of enterprise digital transformation, Li Hui and Liang Dandan believe that the essence of digital transformation is the transformation of enterprises by digital technology, which makes enterprises more intelligent and digital in the face of uncertainty, and improves the production efficiency of enterprises[2]. Zhang Pei and Zhang Miaomiao emphasize the horizontal and vertical role of technology in promoting the digital transformation ofenterprises, and divide the digital transformation of enterprises into four types: leverage, parallel drive, internal drive, and powerless type [3].

Foreign research on digital transformation started earlier, and the earliest mentioned concepts of digital transformation were McCarthy M and Patel K (Patel and McCarthy, 2000), but they did not conceptualize this term. Throughout foreign studies, few scholars have made an accurate, strict definition and in-depth analysis of the concept of digital transformation. At present, the generally accepted definition of digital transformation in the academic community means that it redefines entrepreneurial thinking, business model, innovation mechanism, management mode, etc., which is not only the back-end operation of Internet technology, but also has a profound impact on the whole organization. For the factors affecting digital transformation, most scholars believe that it is mainly customers, organizations and technologies. In view of the digital transformation at the technical level, Marc K. Peter etcetera. mentioned that the rapid development and application of big data, cloud computing, blockchain and artificial intelligence provide technical support for the digital transformation of enterprises[4].

2.1.2. Research on "Double-Qualified" Teachers at Home and Abroad

There is abundant research on "double-qualified"; teachers at home and abroad. After consulting a large number of research data, the research mainly focuses on the concept of "double-qualified"; teachers and the path of ″double-qualified″ teacher team construction. The research process is generally gradually expanded from the concept standard to the quality and construction path. In addition, there are some comparative studies on the training of training courses, legal systems, evaluation mechanisms and other safeguards.

At present, domestic scholars have carried out a lot of research on the construction of "double-qualified" teachers, and made several discussions on the connotation, system, training, standards and other aspects. The more comprehensive studies are Linwei Tang and Mingxing Zhou in the Review of Research on "Double-qualified" Teachers in Vocational Colleges, The research comprehensively interprets the concept development process of "double-qualified" teachers, Point out that: Conceptually, There are "double certificate", "double ability (double quality)", "superposition", "double title", "double level", "specific" said; From the standards said, Administrative standards, college standards and academic standards; In terms of the culture mode, There are college training mode, enterprise grafting mode, school-based training mode and self-generation mode; In terms of management, There are three levels: individual, school and country; In terms of the development trends, There are "three division type" and "four division type" said.In terms of development pathways, international vocational teacher training systems demonstrate three core components: professional standards, qualification certifications, and curriculum design. These systems are characterized by broad - based professional standards, tiered qualification frameworks, and spiral curriculum structures[5].In the

"double" teacher team construction path and training mode, higher vocational education needs a know the teaching rules, and has rich practical experience of "double" teachers, teacher construction should take the policy of combination, to strengthen the construction of teachers' theory and professional skills training, establish efficient professional development system, at the same time from production, practice into the classroom.

Internationally, there is no equivalent term for "dual - qualified teachers" as used in China. Instead, various countries have developed context - specific terminology reflecting similar concepts tailored to their vocational education systems. Notable examples include Germany's "dual - system vocational educators," the UK's "integrated teachers," and Japan's "vocational training instructors." Although differing in terminology, these frameworks all impose rigorous standards for pre - service, in - service, and post - service teacher professional knowledge, practical competencies, and teaching capabilities.

2.1.3. Study Review

At present, the domestic academic circles have rich research on the construction of "double-qualified" teachers, especially the research results in the quality of "double-qualified" teachers are relatively mature. However, there are also some shortcomings: first of all, the research on the connotation of "double-qualified" teachers has not formed an authoritative and unified statement, which is not conducive to the certification and management of "double-qualified" teacher qualifications. Secondly, most of the current studies on the problems existing in the construction of "double-qualified" teachers adopt the method of qualitative research, and adopt relatively few quantitative research literature, which leads to the insufficient proposed countermeasures. Finally, most of the current research on "double-qualified" teacher training focuses on practical ability, teaching level, professional theory, and there is less research on the legal guarantee, ideological and moral construction and educational function of the construction of "double-qualified" teachers. In particular, there are fewer studies on private vocational education institutions. Some foreign vocational education countries have formed a unified and authoritative certification system and a systematic teacher professional development system, but there are few problems and countermeasures on the construction of teachers in foreign vocational education colleges. This makes the direct connection between private vocational colleges low when drawing on the experience of foreign vocational education teachers. Therefore, it is urgent to build a team of "double-qualified" teachers who are in line with the actual situation of Guangdong Province, the characteristics of private higher vocational colleges and the requirements of digital transformation.

2.2. Background and Significance of the Topic Selection

2.2.1. Background

The party's 20th report clearly puts forward "promoting the digitalization of education", and the construction of education digitalization has increasingly become the focus of education reform and development. General Secretary Jinping Xi has pointed out that in the new journey of building a modern socialist country in an all-round way, vocational education has a broad future and great potential, and we must take the building of teachers as the basic work. The 14th Five-Year Plan for Education Development in Guangdong Province proposes that "the quality of teachers should be steadily improved and take the lead in establishing a high-quality development model of vocational education with Chinese characteristics. By 2025, the proportion of" double-qualified " teachers in vocational education should reach 65% of teachers in professional courses. However, there are some problems in the private higher vocational colleges in Guangdong province, such as the insufficient number of professional teachers, the unreasonable structure, and a small proportion of "double-qualified" teachers. Therefore, under the background of digital transformation, it is urgent to analyze the problems existing in the construction of "double-qualified" teachers in Guangdong private vocational colleges, and to build a group of high-quality, professional and innovative "double-qualified" teachers.

2.2.2. Significance of the Topic Selection

Because the private higher vocational colleges teachers in status, treatment and security

mechanism and public higher vocational colleges, combined with the private vocational colleges focus on enterprise performance management mode, the development of teachers to grow the cost is not high, personnel liquidity is bigger, private higher vocational colleges "double-qualified" teachers team construction process is long. In the case of 1000,1000 in the Institute. With digital transformation as the research background, build with the characteristics of Guangdong private vocational colleges "double-qualified" teachers team construction path, help to enrich and perfect Guangdong higher vocational colleges "double-qualified" teachers team construction system theory, further understanding "double" teachers team construction, digital can improve Guangdong private vocational colleges "double-qualified" teachers team construction quality.

3. SURVEY AND ANALYSIS OF THE CURRENT STATUS OF THE CONSTRUCTION OF DUAL-QUALIFIED TEACHER TEAMS IN GUANGDONG PRIVATE HIGHER VOCATIONAL COLLEGES

3.1. Study Design

In order to better understand the Guangdong private vocational colleges "double type" the basic situation of teachers team construction, the survey selected 2024 higher vocational education "innovation school project" in 12 teachers of private vocational colleges as the survey object, the combination of quantitative research and qualitative research, and give priority to with questionnaire survey, interview survey, text analysis complementary way.

Table 1. Basic situation of 12 private higher vocational colleges in Guangdong Province

Serial Number	School Name	Location City	Planning Category	Assessment Score	Ranking	Region
1	Guangzhou Urban Construction College	Guangzhou	Category A	78.25	27	Pearl River Delta
2	Guangzhou Nanyang Polytechnic College	Guangzhou	Category A	76.32	33	Pearl River Delta
3	Guangzhou Huali Science and Technology Vocational College	Guangzhou	Category B	82.09	43	Pearl River Delta
4	Guangdong Xin'an Polytechnic College	Shenzhen	Category B	78.22	46	Pearl River Delta
5	Guangdong Country Garden Polytechnic College	Qingyuan	Category B	74.86	52	Northern Guangdong
6	Guangdong Nanfang Polytechnic College	Jiangmen	Category B	72.69	53	Pearl River Delta
7	Guangzhou International Economics College	Guangzhou	Category B	64.46	63	Pearl River Delta
8	Guangdong Wenli Vocational College	Zhanjiang	Category B	64.34	64	Western Guangdong
9	Zhuhai Art College	Zhuhai	Category B	63.02	67	Pearl River Delta
10	Huizhou Economics and Polytechnic College	Huizhou	Category B	60.95	69	Pearl River

						Delta
11	Guangdong Innovative Technology College	Dongguan	Category C	76.98	79	Pearl River Delta
12	Chaoshan Polytechnic College	Jieyang	Category C	68.11	87	Eastern Guangdong

3.1.1. Design of the Questionnaire

The questionnaire has designed 33 questions around the development of "double-qualified"; teachers in private higher vocational colleges under the background of digital transformation. The questionnaire is divided into seven dimensions, namely: basic information, digital literacy level, training, identification standards, evaluation and employment of professional titles, incentive and introduction.

3.1.2. Compilation of the Interview Outline

Considering that some questions were difficult to show in the form of questionnaires, or could not be answered in more detail, in order to have a more thorough understanding of the research questions, this study used the interview method to interview 11 "double-qualified" teachers in HJ College. The interview mainly includes five dimensions, namely, the connotation and identification standards of double--qualified teachers, the training of double--qualified teachers, the incentive policy of double--qualified teachers, the title evaluation and employment of double--qualified teachers and the loss of teachers.

3.1.3. Data Collection

The research group uses the questionnaire star to edit and distribute the questionnaire online. The 12 private colleges and universities in Guangdong Province have been recognized as "double-qualified" teachers or have the opportunity to be recognized as "double-qualified" teachers in the future, and distributed and collected the questionnaire mainly through the online filling and answer method. By the end of November 2024, a total of 250 questionnaires had been collected, and invalid questionnaires were removed, and 230 valid questionnaires were collected, with an effective recovery rate of 92%. The recovered data were entered and statistical analysis using the statistical software SPSS20.0. Through one-dimensional frequency analysis of single choice and multiple choice, the specific distribution of survey data can be obtained.

3.2. Analysis of the Survey Results

3.2.1. Basic Information of the "Double-Qualified" Teachers

The one-dimensional frequency analysis of the basic information of "double-qualified" teachers can grasp the structural characteristics of the number, gender structure, age structure and teaching age structure in the current teaching team.

3.2.1.1. Number of "Double-Qualified" Teachers

In the survey of the number of "double-qualified" teachers, there were 200 "double-qualified" teachers, accounting for 86.96%, and 30 non- "double-qualified" teachers, accounting for 13.04%. It can be seen that private higher vocational colleges attach more attention to the construction of "double-qualified" teachers.

3.2.1.2. Gender Structure

Among the total teachers surveyed, 110 are male teachers, accounting for 47.83%, and 120 are female teachers, accounting for 52.17%. The number of male teachers is slightly lower than female teachers, but the gap is not large.

3.2.1.3. Age Structure

In terms of age structure, teachers aged 41-50 are the most, a total of 100, accounting for 43.48%, followed by teachers aged 36-40, a total of 60, accounting for 26.09%, followed by teachers aged 51-60, a total of 60, accounting for 26.09%, and finally teachers under 35, only 10, accounting for 3.34%. It can be seen that the "double-qualified" teachers are generally middle-aged. Most of the teachers are between 40 and 50 years old, and the number of older teachers is large.

Table 2. Basic situation of teachers in 12 private higher vocational colleges in Guangdong Province in 2023

Serial Number	School Name	Proportion of Dual-qualified Teachers among Professional Course Teachers (%)	Proportion of Teachers with Senior Titles (%)	Student-teacher Ratio	Number of Industry Tutors Hired (persons)	Annual Amount of Special Financial Appropriation (ten thousand yuan)
1	Guangzhou Urban Construction College	80.04%	22.13%	17.53	564	876.33
2	Guangzhou Nanyang Polytechnic College	74.47%	26.06%	16.76	29	3580.86
3	Guangzhou Huali Science and Technology Vocational College	69.60%	20.11%	20.08	187	2490.33
4	Guangdong Xin'an Polytechnic College	54.61%	22.88%	22.44	106	0
5	Guangdong Country Garden Polytechnic College	38.21%	23.17%	10.73	54	741.24
6	Guangdong Nanfang Polytechnic College	60.07%	26.86%	17.72	405	23
7	Guangzhou International Economics College	39.84%	20.12%	23.77	83	0
8	Guangdong Wenli Vocational College	51.30%	33.62%	17.75	10	0
9	Zhuhai Art College	35.78%	20.53%	14.92	58	449.98
10	Huizhou Economics and Polytechnic College	44.14%	20.00%	20.49	87	1711.00
11	Guangdong Innovative Technology College	43.12%	20.37%	14.13	302	2697.88
12	Chaoshan Polytechnic College	39.30%	12.84%	22.34	11	1564.32
	Average Value	52.54%	22.29%	18.22	158	1177.91

3.2.1.4. Teaching Age Structure

In the teaching age structure, the number of people with education over 15 years is the largest, with 120 people, accounting for 52.17%, followed by the number of people with education over 11 to 15 years, accounting for 80 people, accounting for 34.78%, and under 10 years, 30 people, accounting for 13.05%. This shows that in order to meet the requirements of double-qualified"teachers, the accumulation of teaching working years is needed.

3.2.2. The Digital Literacy Level of "Double-Qualified" Teachers

The rapid development of digital economy has promoted the digital transformation of vocational education, which puts forward new requirements for the "double-qualified" digital teaching ability of private higher vocational colleges. Digital teaching ability refers to teacher; awareness,

accomplishment, ability and research to integrate digital technology into teaching. According to the questionnaire survey of "double-qualified" teachers, only 30 people can widely use digital technology tools in teaching, accounting for 13.04%; 100 people often use digital technology tools in teaching, accounting for 43.48%. This shows that ;double-qualified teachers have a strong awareness of actively integrating digital technology into teaching. According to the questionnaire survey of whether double-qualified teachers have enough time and energy to participate in the development and construction of digital teaching resources, 20 people have almost no time and energy, accounting for 8.69%, 120 people have some nervous time and energy, accounting for 52.17%, 80 people are very intense time and energy, accounting for 34.78%, and 10 people have enough time and energy, accounting for 4.36%. This shows that due to the limitation of time and energy, teachers' ability to actively use digital technology to carry out teaching and research needs to be improved. According to the digital economy era "double" teachers need to improve the ability of the questionnaire survey, the first is the digital teaching design, implementation and evaluation ability, accounted for 86.96%, the second is the digital resources development, integration and application ability, accounted for 78.26%, ranked third is digital communication, communication and collaboration ability, accounted for 69.57%. This shows that improving the digital teaching ability of double-qualified teachers is the core content of the digital transformation of vocational education.

3.2.3. Training of "Double-Qualified" Teachers

According to the survey of whether the "double-qualified" teachers have participated in the training of digital technology skills, only 20 people, accounting for 8.69%, have participated in the digital technology training for many times. Therefore, private higher vocational colleges in Guangdong Province should increase the training in the application of "double-qualified teachers, and provide them with needed training according to their title, gender, type, so as to better promote "double-qualified" teachers to master digital technology tools and apply them to the actual teaching work.

3.2.4. Identification Standards for "Double-Qualified" Teachers

According to the questionnaire survey on whether the identification criteria of "double-qualified" teachers are clear, 60 are very clear, accounting for 26.09%, 120 are clear, accounting for 52.17%, 30 are clear, accounting for 13.04%, and 20 are not clear, accounting for 8.7%. This shows that most teachers have a clear understanding of the standards and basic conditions of "double-qualified" teachers. "double-qualified" teachers need to have good ideological and political quality and ethics, solid teaching ability and enterprise practice ability, be familiar with the industry situation, and be able to integrate new technologies and new processes into teaching. Different levels (primary, middle, high) have different specific requirements, different provinces and different regions have specific rules, but they are not lower than the national standards.

3.2.5. Professional Title Evaluation And Employment Of "Double-Qualified" Teachers

Through the "double type" teachers in higher vocational colleges in Guangdong province in the title evaluation have separate evaluation channel or standard questionnaire survey, no difference, and other teachers have 120 people, 52.17%, have some difference between 40 people, accounting for 17.39%, have completely independent 30 people, 13.04%, which suggests that most higher vocational colleges are not in the title evaluation of "double-qualified" teachers policy, this is not conducive to improve private higher vocational colleges teachers to participate in the "double-qualified" teachers that initiative.

3.2.6. Incentive Policies for "Double-Qualified" Teachers

Through the private vocational colleges in Guangdong province to "double" teachers incentive policy questionnaire survey, the school of "double" teachers incentive policy generally 110 people, 47.83%, the poor 30 people, accounted for 13.04%, better 60 people, 26.09%, very good 30 people, accounted for 13.04%, this shows that most of the private higher vocational colleges to "double" teachers incentive policy needs to be improved.

3.2.7. Introduction of "Double-Qualified" Teachers

Through the private vocational colleges in Guangdong province in the introduction of "double" teachers may face difficult questionnaire survey, in the first is less attractive, accounted for 95.65%, in the second is the talent recruitment competition, accounted for 65.22%, the third is recruitment channels is limited, into the school culture difficulties, accounted for 43.48%. This shows that compared with public colleges, and it is difficult to introduce excellent high-level "double-qualified" teachers.

4. CONCLUSION AND POLICY RECOMMENDATIONS

Against the backdrop of rapid evolution in the digital economy industry, private higher vocational colleges in Guangdong face multiple challenges in their dual-qualified teacher teams:Imbalances in the quantity and structure of dual-qualified teachers;Urgent need to improve teachers' digital literacy;Insufficient financial investment and formalistic school-enterprise cooperation;Inadequate policy support and incentive mechanisms.These challenges lead to a mismatch between the digital competency supply of dual-qualified teachers and the demands of the digital economy industry, constraining the high-quality development of regional vocational education. To address this, the following measures are proposed.

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