Design of Visual Communication Teaching System Based on Artificial Intelligence and CAD Technology

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Abstract. The updates of artificial intelligence (AI) and CAD technology are triggering the innovation of education concept, education method and education means. This paper takes the impact of contemporary visual communication design on design methods, design means and presentation methods brought by AI and CAD as the starting point, combines the possibilities brought by the characteristics of AI and CAD to the teaching mode, integrates and deepens the development of educating mode, makes AI and CAD play a benefit in the educating of visual correspondence design, so as to transform and upgrade to the intelligent teaching of visual communication design.

Keywords: artificial intelligence; CAD technology; visual communication design; teaching mode system

1   INTRODUCTION

Human society's reliance on digitalization and information has reached an unparalleled level. In the context of the new era, design has also undergone a series of remarkable changes. Gawer [1] believes that digital platform companies and their ecosystems are symbolic organizational forms in the digital era. It introduces the main impact of the rise of digital platforms and ecosystems on competition and innovation. Modern digital media technologies have transformed various types of artworks into data files for easier and faster dissemination. Virtual reality technology has enabled design in a variety of forms. In this uncertain and unprecedented era, the use of technology has become crucial for maintaining connections with friends, family, work, and society. Uprichard [2] explores the benefits and barriers of e-learning. Experience as a digital project nurse helping community nurses implement e-learning. It can create a simulated three-dimensional environment based on human characteristics, as if in the real world [3]. This makes the design form gradually towards virtualization. We don't really need to build a house in order to have the experience of living in it. Mature multimedia technology, which more realistically simulates reality, has completely

realized the paperless design presentation and communication process [4]. At the same time, modern society shares enough information that personalized design is constantly valued. All these are attributed to the computer technology that has developed beyond imagination, as if everything is possible and everything is no longer limited. Behind the "Alpha Go" 4:1 victory over human professional Go masters, is the development of "horrible" AI. The world is surprised by the omnipotence of AI, but also vaguely worried about the future of human development where to go.

AI is a field of computer science that attempts to understand the laws of human intellectual activity in order to produce a system that is similar to human intelligence in order to perform the corresponding work instead of humans. Keeping ahead is becoming increasingly difficult and challenging due to rapid growth and changing digital technologies and AI based solutions. To address these challenges, Nahavandi [5] introduced the concept of Industry 5.0, where robots are intertwined with the human brain and work as collaborators rather than competitors. The main areas of research in AI currently include robotics, language and image recognition, natural language processing and expert systems. The rapid development of AI resembles a situation with two sides, and no one can predict exactly what the future it will bring will look like. Everything in modern society seems to be unpredictable, and the possibility of simply knowing a subject and doing only one job for a lifetime is slim. In recent years, the labor market situation is such that it is difficult to hire highly qualified employees with even higher salaries. Jo ó s et al [6] A device that digitizes traditional impression or plaster molds through indirect computer-aided design/computer-aided manufacturing (CAD/CAM) in dentistry. It analyzes whether the virtual model has the same authenticity as the slice model.

Nowadays, people's work and life are greatly affected by AI, and visual communication design has also been transformed and upgraded under the drive of AI [7]. Facing the challenges, besides the need to assist design work through AI, it is also necessary to use AI to get through the limits of plan and handle the new heading of plan. The State Council, in the "New Generation of AI Development Plan" released, points out that intelligent technology should be used to promote the reform of teaching models, speed up the foundation of intelligent learning frameworks, and do the development of shrewd grounds. The idea of " AI + training" advances instructive advancement and turns into a significant help for the improvement of an astute educating model. Consequently, schools need to contemplate how to more readily coordinate across disciplines, utilize the benefits of AI, make changes in light of the customary visual correspondence configuration showing model, and construct another model of canny, customized and incorporated educating.

2 THE CURRENT CHALLENGES OF CHINA'S VISUAL COMMUNICATION PROFESSIONAL CURRICULUM

Visual communication design is a profession introduced earlier in the teaching of art and design in China. In the growing e-commerce market, traditional advertising operations cannot fully meet advertising needs. Therefore, artificial intelligence technology is applied to advertising to improve efficiency and meet market demand. Through observation of the Chinese advertising market over the past five years, Qin and Jiang [8] have in-depth understanding of the application of artificial intelligence technology in the advertising process. Compared with other art and design majors, the curriculum construction is relatively complete, mainly including graphic creativity, logo design, layout design, web design, graphic design, advertising design, packaging design and corporate image design. With the popularity of smart phones, many institutions have added UI interface design courses. The visual communication profession has developed with the changing times, and its connotation and extension are gradually expanding as it is very sensitive to technological changes, market demand and aesthetic changes of the public. "Innovation" and "creativity" are the natural attributes of the visual communication profession itself, and works are more often presented in paper printing or multimedia performance [9]. The innovation of information technology, especially the large-scale application of "intelligent technology + APP", has forced the teaching of visual communication to be constantly updated in terms of aesthetic concept, means of expression and

form, which requires practitioners not only to have the ability and quality of market research, design scheme conception and physical design production, but also to use the knowledge of communication.

2.1 The Design of Professional Structure is Not Well Adapted to the Needs of Dynamic Adjustment of Industrial Structure

Professional setting is the premise of design education talent training. From the viewpoint of professional types, the surface of visual communication majors in schools is narrow and not as comprehensive as that in foreign countries, and at the same time, the depth of research is not enough; the goal of talent training is also mostly to provide skills to facilitate future employment, lacking the training of comprehensive quality of designers. Yang [10] supported the development of a tool proposal for online teaching of packaging design. In addition to providing an unprecedented tool, the study also confirmed the advantages of graphic visual strategies as project thinking facilitators.

2.2 Lack of Focus on General Ability and Comprehensive Quality in Talent Training

In the background of the information era, on the one hand, the automation and intelligence of production are increasing, which makes the traditional jobs disappear or merge; on the other hand, the positions of art and design are special, and in addition to the professional practical skills that everyone can learn, there are also design art connotations that cannot necessarily be learned. The only thing that can be taught is craft and skill. This also illustrates the difficulty of cultivating excellent art and design talents, as shown in Figure 1. The profound changes in the nature of modern work and the gradual increase in the demand for comprehensive quality have put forward a broader demand for the professional knowledge and comprehensive quality of relevant practitioners.
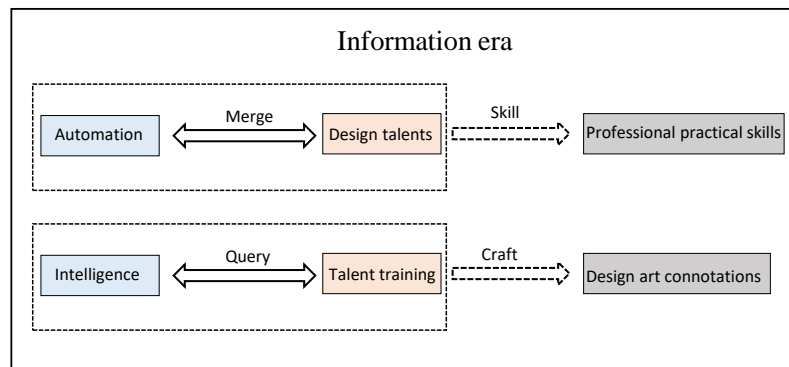

Figure 1: Block diagram of general ability and comprehensive quality in talent training.

2.3 The Education and Training Function of Visual Communication Majors Fails to Better Fit the Needs of Social Development

From the late 1990s to the present, according to incomplete statistics, the number of domestic design colleges and related visual communication majors has grown to more than 700. So far, there are still many colleges and universities running around to start visual communication majors. The number of reckless expansion has caused the lack of teachers in visual communication majors to become more serious, and the corresponding consequences are blurred educational objectives, chaotic educational management, and lagging educational contents; everything is a vicious circle when it cannot meet the requirements of design talents training. In terms of curriculum arrangement, it fails to establish a good connection between professional courses and basic courses. The basic courses generally

belittle the phenomenon of composition, creativity and individuality, and students cannot raise their skills to the degree of ability required by the profession. As a result, students are left with no way to start when they are exposed to design cases in practice with concrete images. Or will only simply and directly repeat the reproduction, lack of creativity and individuality of expression.

The need of social development (L) is chosen to measure the comparability between the education and training function of visual communication majors, and the formula is:

$$R_i = \sum_i \left(-d_{pi}^2 / 2S_p^2 \sigma_i^2\right)\delta \tag{2.1}$$

$$L = \frac{R_i}{\sum \delta} \tag{2.2}$$

$$L = \frac{\sum_i \left(-d_{pi}^2 / 2S_p^2 \sigma_i^2\right)\delta}{\sum \delta} \tag{2.3}$$

Where: p is the ID of related visual communication majors; i is the ID of the key point of visual communication majors, d_{pi} denotes lack of teachers in visual communication majors between the i-th visual communication majors predicted by the p-th educational objectives; S_p denotes professional courses and basic courses; o denotes educational management; v denotes educational contents ; δ is requirements of design talents training. According to the above formula, it is easy to see that the education and training function of visual communication majors fails to better fit the needs of social development (See Figure 2).
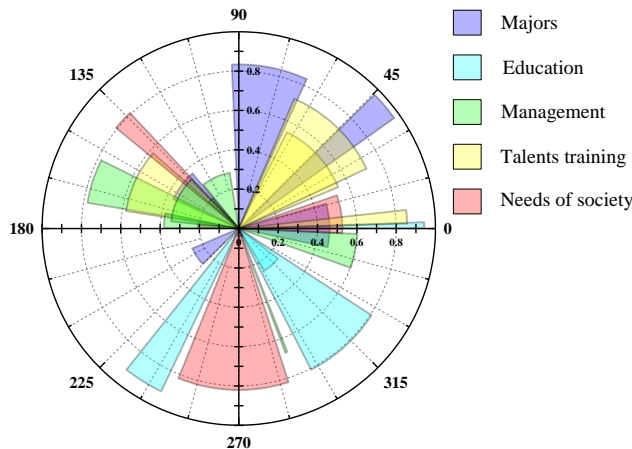

Figure 2: The Rose cloud of education and training function of visual communication specialty with the needs of social development.

3   THE IMPACT OF AI AND CAD ON VISUAL CORRESPONDENCE DESIGN

Visual correspondence is the design behavior of spreading specific information through various visual media. It has a lot of influence on design methods and presentation, visual culture education and visual communication design personnel training.

3.1 Changes in Design Methodology and Presentation

As illustrated in Figure 3, the intelligent design work platform uses AI technology to change the design method of traditional designers, and through massive data analysis to regulate and classify information, rearrange and combine them according to customer needs to maximize the efficiency of output, and achieve the maximum commercial value through "intelligence" and "personalization". The maximum commercial value is achieved through "intelligence" and "personalization".

The visual correspondence show has been reached out from a solitary two-layered plane to a media three-layered space. Traditional paper books with the help of augmented reality technology through intelligent terminals, the static graphics to expand the audio-visual multi-directional experience, to achieve the reader and the virtual image of "interaction. For instance, a wide range of books have added increased reality understanding capability, perusers can download the client through the gadget and sweep the QR code, the static paper books will introduce three-layered intuitive pictures. AI brings better approaches for showing, understanding the intuitive impact of multi-point turn of pictures and blend of sound and video, which is more advantageous for the correspondence and learning of conceptual information.

The rapid development of AI makes its influence in the field of design more and more extensive, in addition to the application in the field of graphic design such as augmented reality, but also to industrial products, environmental architecture, film and video games and other design fields. The design industry is actively making changes in the face of the development of AI, and many large companies are re-examining design positions and adding many AI professional-related positions to the original foundation. Consequently, to develop phenomenal creators in the new time, schools ought to effectively make educational acclimations to address the difficulties achieved by the modern change, in order to address the issues of the business.
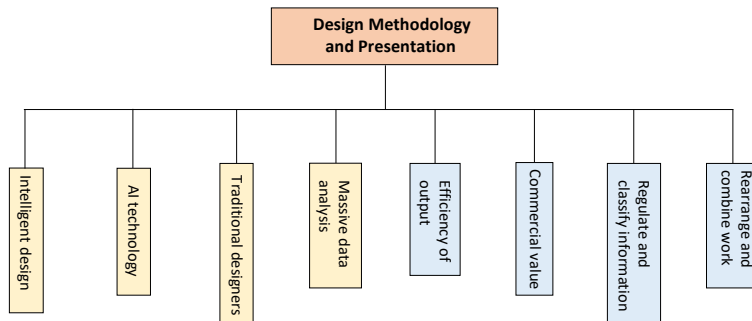

Figure 3: Structure diagram of design methodology and presentation.

3.2 The Embodiment of AI Technology and CAD Technology in the Field of Visual Culture Education

AI is currently in the explosion of the industry, countries around the world are actively carrying out relevant academic research to advance the improvement of the business, China's performance in the field of AI is also more prominent, the research on AI is invested in a large and deep, the government has put forward more policies to support the research of AI. Research shows that by 2012, the number of AI patent applications in China has exceeded that of the United States. In addition, in the field of education, China has made in-depth thinking and research on the combination of AI and education teaching system. 2017 July, the State Council released the "new generation of AI development plan" clearly pointed out that "AI has become a new focus of international competition" "the use of intelligent technology to accelerate the reform of talent training mode and teaching methods, build a new education system that includes intelligent learning and interactive learning;

carry out the construction of intelligent campuses and promote the application of AI in the whole process of teaching, management and resource construction; develop three-dimensional comprehensive teaching field and online learning education platform based on big data intelligence; develop intelligent education assistants and establish an intelligent, fast and comprehensive education analysis system; and Establishing a learner-centered education environment, providing accurate push education services, and realizing the customization of daily and lifelong education."

The 13th Five-Year Plan for National Education Development promulgated by the State Council explicitly requires accelerating the creation and use of the "three channels and two platforms", speeding up the development of education informatization, and developing new instructing models through the Internet, big data, AI and virtual reality technologies. Construct a new teaching model. Nowadays, AI is not only included in China's government work report, but also included in China's "Science and Technology Innovation 2030 - Major Projects" plan. Therefore, many universities have deeply integrated AI technology with teaching and set up virtual labs to carry out experimental activities through virtual reality technology.

Virtual reality is an information communication simulation technology for multi-sensory experience such as visual, auditory, and haptic. As early as September 2018 issued by the Ministry of Education, the Opinions on the Implementation of the Excellent Teacher Training Program 2.0 states that teachers should strengthen the use of virtual reality, augmented reality and mixed reality technologies to convert traditional teaching thinking and build interactive curriculum resources. Figure 4 shows the relationship between virtual reality technology and multi sensory experiences such as visual, auditory, and haptic. From the Figure, the immersive space, rich interactive capabilities and real-time response mechanisms of virtual technology can help intuitively deal with complex and abstract problems, thereby stimulating active exploratory behavior for students' learning. There are already many companies and social institutions applying virtual reality technology in visual communication related design presentations.

China is currently in a phase of economic transformation, and the explosion of the AI technology wave is a good opportunity for development. In the future, the combination of school education and AI technology is an inevitable trend, and experts and scholars are constantly thinking about how to rationally integrate AI into school education in universities, secondary and elementary school. AI enables personalization and individualization of learning, and with the support of this technology, education can be better promoted.
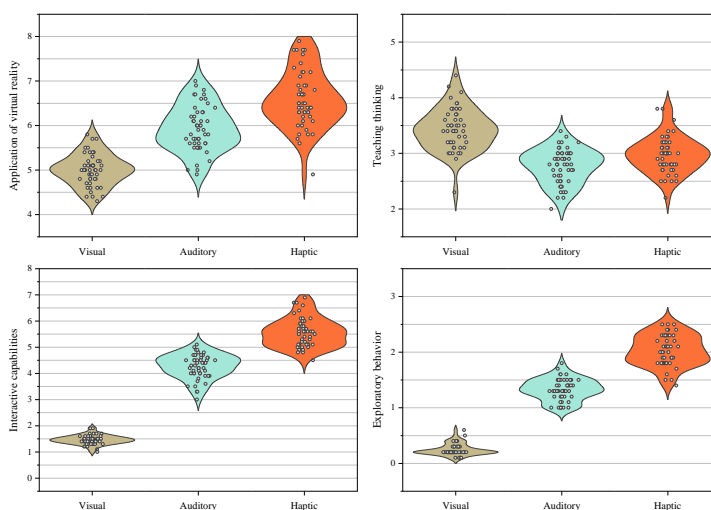

Figure 4: The relationship between virtual reality technology and multi-sensory experience of visual, auditory, and haptic.

3.3 The Combination of AI and CAD Technology with Visual Communication Design Talent Training

In the field of visual communication, using the programming of AI, a computer can complete the design of a high-quality poster in minutes. There are already case experiments where multiple types of design solutions can be automatically generated in 10 seconds with the help of techniques such as analysis of AI data and language processing (as statistically depicted in Figure 5). Such experiments already show the disruptive shift in the future of the entire industry. The change of the industry model will surely affect the way of training talents in universities.

How to integrate the traditional curriculum and teaching methods of visual communication design majors with AI technology and the overall development of the design industry, and how to meet the needs of the times is a question worthy of consideration by educators. It is especially important to change the teaching methods of professional courses, stimulate students' creative thinking ability, and establish the education system of "intelligence + visual design" for the cultivation of visual communication design talents nowadays. Some of the top institutions abroad pay more attention to students' ability to express their ideas and insight in the cultivation of visual culture talents. The cultivation of talents in the age of intelligence is more inclined to personal learning, learning of personality and cultivation of creative ability, so such cultivation is more in line with the requirements of this era.

At present, intelligent teaching systems have been more widely used in linguistics, electronic engineering and other disciplines, mainly in learning assistance inside and outside the classroom, and such applications have greatly reduced the workload of teachers. AI can replace teachers' mechanical work in many aspects, such as after-class question and answer, homework tutoring and other assistance, which can replace teachers, which is conducive to teachers devoting more energy to inspiring teaching activities, such as the development of creative thinking, personalized learning guidance, etc., and is more suitable for contemporary teaching and talent training.

According to Villegas et al., the combination of AI and visual communication design talent training V_j is constructed to represent the traditional curriculum and teaching methods of visual communication design G to artistic expression and expand the depth of cultural factors and social factors (each factor i corresponds to a coefficient, representing the x and y of the teaching methods of professional courses), and then teachers' mechanical work F_k are fused to talent training in colleges and universities f_k from the predicted deviation h_k.

$$V_j = G\left[x_j + F_k\left(x_j\right) - x_i \right] h_k\left(x_j\right) \tag{3.1}$$

$$f_k\left(x_k\right) = \sum_j \frac{1}{\pi R^2} V_j \tag{3.2}$$

$$f_k\left(x_k\right) = \sum_j \frac{1}{\pi R^2} G\left[x_j + F_k\left(x_j\right) - x_i \right] h_k\left(x_j\right) \tag{3.3}$$

4 AI VISUAL COMMUNICATION DESIGN TEACHING REALIZATION PATH

Under the many influences brought by AI to design, how the visual correspondence design profession can meet the needs of the times and how visual communication designers can cope with work efficiency and learning depth less than AI is a problem worth thinking about. Therefore, it is necessary to set up the goal of cultivating emerging designers who lead the trend of the times, and respond to the challenge by optimizing design teaching curriculum, teaching mode and teaching means.
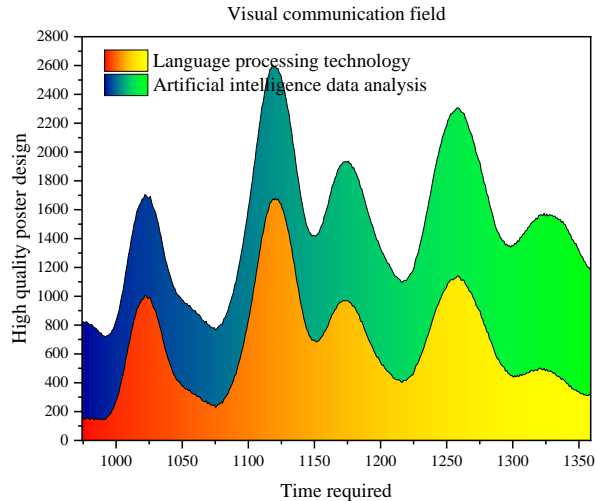
Figure 5: Curve filling diagram of comparison of AI and visual communication design talent training.

4.1 Focus on Personalized Learning

Social interest is the major premise of showing norms in schools, so the advancement of showing mode can't be restricted to the investigation of general showing techniques, however should roll out instructive improvements as per the improvement of the times and public arrangements, lay out the instruction idea of "AI + visual correspondence plan", in order to exactly situate the preparation targets and make showing method of expert courses. In the conventional showing mode, the greater part of the classes are held in the study hall.

In the customary showing mode, the homeroom is for the most part made out of one educator and a few understudies, and the showing content is organized directly, from basic knowledge to professional knowledge, so that students can learn professional knowledge and skills from awareness to basic mastery and then proficient use. However, in the teaching mode using AI, the focus of teaching is not to divide the knowledge system and give it to all students simultaneously, but to focus closer to students' individuality and needs. We can find the knowledge points that each student is good at and interested in in the same knowledge system, and advance more deeply along the interest points to obtain the knowledge applicable to different students. Zeroing in on customized learning breaks the conventional one-way information move model. In a relative field, understudies' way of learning is different, with some zeroing in on generally handle, some on market interest, and some on private profound articulation.

4.2 Increase the Courses Related to AI and CAD

In the context of the rapid development of AI, visual correspondence configuration majors show all the more recent fads in the coordination of workmanship and innovation, and develop new gifts reasonable for society, schools should reasonably add AI-related curriculum in the curriculum arrangement. The information interaction design program of Nanjing Art Institute applies AI technology in its existing professional curriculum system, and the curriculum mainly focuses on interaction design in the direction of user experience, virtual reality and information visualization. Compared with most colleges and universities that follow the traditional visual communication curriculum, its curriculum has improved the requirements for AI and related algorithm knowledge, and no longer emphasizes the application of basic software, so that the design results are more diversified to meet the development of society.

4.3 Innovative Teaching Evaluation System

In conventional educating, understudies frequently make a one-way broad assessment of the educator's talk content and execution toward the finish of the semester, bringing about dismissing the educational experience and customized development of understudies. The teaching evaluation under the concept of "AI+" education can be analyzed by collecting statistics through big data, dividing the course into stages, and involving teachers and students in each stage. In addition to the basic evaluation of the teacher's teaching contents and methods, the evaluation focuses more on the thorough and precise assessment of every understudy's proficient information, learning status and viability at each stage, so as to discover the potential commonalities and individuality, fortify the reasonableness of educators and understudies in the schooling system, and structure a two-way or even multi-way precise assessment, so that teachers can make appropriate adjustments to the next teaching plan and students' learning methods.

The imaginative assessment framework with regards to AI targets changing understudies from aloof information acknowledgment to dynamic information creation, according to the specific situation of understudies in the educational experience, and then personalizing the cultivation of students to avoid the generalized deficiencies and defects in the traditional assessment.

4.4 Transform and Expand the Teaching Concept and Scope, and Combine with Market Demand

Use intelligent and interconnected means to interpret the content of visual communication courses in an all-round and multi-angle way to improve students' learning enthusiasm (in Figure 6). At present, the teaching of visual communication in some art and design schools and colleges remains more in the conventional educating mode, where teachers explain theoretical contents in class according to PPT and assign homework for students to draw by hand or make by computer. This expects educators to figure out how to utilize the Internet in an integrated manner. And also requires teachers to learn to use all kinds of digital centers on the Internet, relying on the course resource base to build and share the platform, to expand the original framework of the course by means of animation, video, micro-lessons, etc., and to change the problems of boring theoretical narration, not enough vivid image of drawing, and lack of targeted answers to difficult questions in daily teaching.
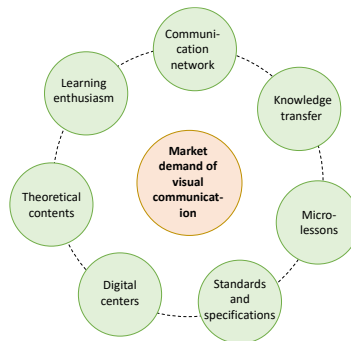

Figure 6: Ring structure diagram of the teaching concept and scope and market demand.

4.5 Realize Intelligent Pushing of Teaching Resources and Data of Teaching Decisions, and Establish a New Hybrid Teaching Mode

If the current popular fields of design disciplines, such as interaction design, interface design and digital media design, are warm-up preparations before the arrival of the era of AI, the new design fields spawned by intelligent and connected technologies will be established at an accelerated pace.

It can be foreseen that in the new contents of service strategy design, system integration innovation design, brand image integration, etc. formed by the visual correspondence profession under the role of big data and cloud computing, the intelligent penetration of teaching resources pushed to the target students makes the interdisciplinary collaborative ability and critical thinking skill of the design profession more powerful, and the benign feedback data of students formed by teachers in the comprehensive use of intelligent APP also makes teaching The data support for teaching decisions further strengthens the relevance of professional knowledge content, improves educating proficiency, and makes the educating process more scientific and well-founded. Simultaneously, the new educating mode will give birth to a new type of design talents - cross-border art and design talents in view of big data, intelligent innovation and innovative applications, which have strong learning ability, understand strategies and can realize innovation and entrepreneurship. Future art and design education and teaching should be closely integrated with AI for the cultivation of human-machine synergy, while focusing on creativity, so that technological progress can serve the teaching of visual communication profession.

4.6 The Practice of Teaching Methods of Visual Communication Under the Leadership of "Creating Situations, Problem Discussion and Task-Driven", and the Shift From Knowledge Transfer to Knowledge Application

Creativity and aesthetics are less likely to be replaced by AI, which is also a typical feature of art and design majors, but if design education sticks to the old way of talent training and continues to follow the traditional closed design education concept, the gap between design education and design industry will only widen. Combined with the requirements of innovation and entrepreneurship, teachers can publish competitions online, interview potential customers to release design projects or simulate customer needs, create situations to guide students for the industry needs for accurate classification, target analysis and discussion to understand their design requirements, experienced and thoughtful teachers can work in depth with corporate operations and product departments to involve students with design tasks assigned by the curriculum, problem-oriented Participate together in formulating business promotion plans and product requirements.

The visual communication under the leadership of "creating situations, problem discussion and task-driven" is defined as a set $\chi=\{\boldsymbol{\beta}_j\}_{j=1,2,3}$, where J is a typical feature of art and design majors, and requirements of innovation and entrepreneurship (u,v) of the jth potential customers is denoted by the vector $\boldsymbol{\beta}_j \in \chi$. Students for the industry needs for accurate classification $\rho_t(\boldsymbol{\beta})$ at each stage providing confidence $S_{jt} \in Rw \times h$ for each typical feature j, where w and h are the gap between design education and design industry, and t denotes the tth stage. The old way of talent training and continues to follow the traditional closed design education concept to provide confidence scores:

$$\rho_t = \sum \left(\boldsymbol{\beta} | \boldsymbol{T} \right) \tag{4.1}$$

$$\rho_t \rightarrow \left\{ s_1^j \left(\boldsymbol{\beta}_j \subset \boldsymbol{\beta} \right) \right\}_{j=1,2,3} \tag{4.2}$$

$$\rho_t = \sum \left(\boldsymbol{\beta} | \boldsymbol{T} \right) \rightarrow \left\{ s_1^j \left(\boldsymbol{\beta}_j \subset \boldsymbol{\beta} \right) \right\}_{j=1,2,3} \tag{4.3}$$

All subsequent stages generate new confidence scores between visual communication teaching methods and academic comprehensive quality using AI technology from the previous stage:

$$\rho_t > \sum \left[\boldsymbol{\beta} | \boldsymbol{T}, \psi \left(\boldsymbol{\beta}, \boldsymbol{S}_{t-1} \right) \right] \tag{4.4}$$

$$\sum \left[\boldsymbol{\beta} | \boldsymbol{T}, \psi \left(\boldsymbol{\beta}, \boldsymbol{S}_{t-1} \right) \right] \rightarrow \left\{ s_t^j \left(\boldsymbol{\beta}_j \subset \boldsymbol{\beta} \right) \right\}_{j=1,2,3} \tag{4.5}$$

$$\rho_t > \sum \left[\boldsymbol{\beta} | \boldsymbol{T}, \psi \left(\boldsymbol{\beta}, \boldsymbol{S}_{t-1} \right) \right] \rightarrow \left\{ s_t^j \left(\boldsymbol{\beta}_j \subset \boldsymbol{\beta} \right) \right\}_{j=1,2,3} \tag{4.6}$$

According to the above formula, the relationship between visual communication teaching methods and improving academic comprehensive quality can be obtained as shown in Figure 7.
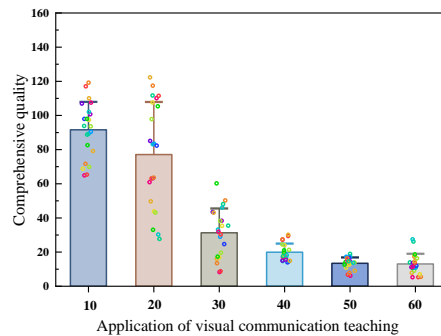
Figure 7: Columnar scatter of the relationship between visual communication teaching methods and improving academic comprehensive quality.

5   CONCLUSION

With the improvement of computing power and big data storage capacity, and the increasing maturity of graphic image algorithms, the future intelligent interconnection means and visual communication professional teaching will be more and more closely combined, and the rapid development of AI and CAD is affecting all aspects of the visual communication design industry. Facing the huge transformation, the first thing we need to think about is how to change our thinking, make a change from the source of education and put it into action, understand the transformation of the teaching path brought by the combination of AI technology and visual communication profession, study its application rules, and refine the most effective information-based teaching methods, which is important to improve teachers' teaching level, maximize students' learning enthusiasm, work on the proficiency and adequacy of educating and learning, and create It is of great significance to create an intelligent and efficient information-based classroom. This paper examines what is going on of visual correspondence configuration educating and the fundamental credits of "AI" with regards to AI, and proposes an innovative education model to break through the framework of the traditional teaching model and explore the realization path by taking advantage of the advantages and characteristics of AI, so as to make visual communication design students more suitable for the direction of the development of the times.

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