

## *Retraction*

# **Retracted: Construction and Analysis of Visual Communication Design Curriculum Based on Random Matrix**

### **Mathematical Problems in Engineering**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

### **References**

- [1] S. Zhan, "Construction and Analysis of Visual Communication Design Curriculum Based on Random Matrix," *Mathematical Problems in Engineering*, vol. 2022, Article ID 1053294, 8 pages, 2022.

## Research Article

# Construction and Analysis of Visual Communication Design Curriculum Based on Random Matrix

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Information technology and cultural education in China are constantly advancing, with more and more advanced technology and innovative teaching models, and the development of education and technology is complementing each other and progressing together. New technology has created new conditions for visual communication in the field of design, which has made great changes in the visual communication industry from form to content, making it more plastic and creative. Design is a rapidly changing profession, and every new technology may bring changes. Therefore, visual communication training must cooperate with modern development, keep up with the information age, and avoid the content and format of professional courses being too old. Visual communication design needs a new teaching form, which not only optimizes the visual communication design of teaching contents and methods but also expands the teaching depth, promotes the innovation and research of teaching mode, and provides multiple guarantees for students' professional development.

## 1. Introduction

Digital media is a change in information technology that is leading the way in art and design, effectively presenting a new visual art experience. Visual communication design is a design that is expressed and conveyed to the audience through visual media, reflecting the contemporary characteristics of graphic design and rich connotations of design. The emergence of digital multimedia constantly challenges and enriches the traditional visual communication methods and extends the contemporary visual communication design, which gradually changes from the previous flat and static form to the dynamic and comprehensive direction, from single media to multimedia, from two-dimensional plane to three-dimensional and space, and from traditional printed design products to virtual information image communication. The transformation is from traditional print design products to virtual information images. Advertising, as an important form of visual communication, has also taken a qualitative leap under the impetus of digital multimedia technology. The new generation of advertising visual communication methods, such as online advertising,

digital film, television advertising, multimedia electronic display, and multimedia interactive advertising, has penetrated all aspects of social life with a rapid development trend. The so-called multimedia is the synthesis of a variety of information media. Multimedia technology is not a simple composite of various information media, but a digital information technology that combines text, graphics, images, sound, video, animation, and other forms of information together, and can support the completion of a series of interactive operations through comprehensive computer processing and control. In today's information society, digital multimedia technology marked by computer science has brought a new atmosphere to advertising design and communication and achieved remarkable social and economic benefits. With the impetus of digital multimedia technology, advertising promotion strategy has also transformed from the stage of pure brand promotion to the stage of more detailed marketing and started to focus on and select regional media, industry media, and media with more detailed market positioning, and the way of digital multimedia advertising operation and release has become more diversified and humanized. In the environment of digital media,

teachers should adjust the construction and development direction of visual design majors, change traditional teaching thinking and methods, and adopt unique and innovative teaching forms [1].

However, at this stage, there are many teaching problems in visual communication design courses.

### 1.1. Teacher Level

*1.1.1. Teachers Dominate and Do Not Keep Up with the Times.* At present, some teachers still adopt the old teaching methods, explaining the basic knowledge first and then letting students practice [2]; some teachers occupy a dominant position and do not guide students to take the initiative to discover new problems, so it is difficult to effectively stimulate students to play their creative power. Some teachers are more accustomed to guiding students to carry out creations in the form of hand drawn, and the teaching content is mostly set to static design based on two-dimensional planes. As a visual and practical art, visual communication design includes not only static and flat visual effects but also dynamic three-dimensional and four-dimensional visual effects [3]. However, some teachers fail to keep up with the times and lack the ability to use new media technology, so it is difficult to realize the teaching conversion of static and dynamic, single- and multidimensional spaces well. In addition, some teachers ignore the new trends and fail to keep abreast of the cutting-edge discipline concepts, resulting in relatively backward teaching contents and teaching methods, which makes it difficult for students to apply the new visual design techniques to their design works.

*1.1.2. Improper Teacher Training, Which Affects the Ability to Improve.* The training system for teachers of visual communication design in some schools is not perfect, and some teachers have not fully mastered the course content system and the skills related to classroom teaching [4]. The training activities for teachers of visual communication design majors carried out by some universities focus on improving teachers' professional ability, and the training of design historiography, design criticism, and other design theoretical knowledge is relatively insufficient. This makes it difficult for some teachers to systematically apply the theoretical knowledge they have learned to guide students' design practice in visual communication design teaching and also makes their teaching process lack of skills [5]. This has a negative impact on the improvement of teachers' teaching ability and professionalism.

*1.1.3. Evaluation Methods Are Relatively Single and Still Weak.* Some teachers of visual communication design courses only pay attention to evaluating students' design works, neglecting students' design practice process, and even if they release online courses, they set chapter quiz scores as the main basis for judging grades, lacking attention to students' growth trajectory and emotional value [6]. The

single, one-sided evaluation method tends to affect students' enthusiasm for learning, and teachers should conduct the course evaluation with openness and diversity.

### 1.2. Student Level

*1.2.1. Students' Participation Is Not High, and the Learning Effect Is Not Ideal.* In the past, the design course was that the teacher spoke and the students listened, some students passively received knowledge, and it was difficult for them to actively discover problems, their thinking was restricted, and they often just completed the design tasks according to the teacher's requirements. For students with a solid foundation, they can successfully complete the task according to the requirements; for students with a weaker foundation, they have not fully understood the theoretical knowledge taught by teachers and have to learn to apply it, which may produce fear and burnout [7]. The visual communication design course has a strong practical nature, and students' participation in practical activities is not enough, their enthusiasm will be reduced, and the learning effect will not be satisfactory.

*1.2.2. Insufficient Design Appreciation and Lack of Artistic Creativity.* Visual communication design is a discipline involving a wide range of fields. Under the background of new liberal arts teaching, although some visual communication design courses have been integrated across majors, they still lack the systematic integration of related professional teaching resources [8]. In addition, some students lack the ability to learn independently and only learn the basic knowledge in a step-by-step manner, lacking the awareness to improve their professional skills and the motivation to design works independently, so the designed works often lack creativity and the theme and connotation of the works are insufficient [9]. Therefore, only by enhancing students' aesthetic ability and creativity, they can design visual works with artistic creativity.

Therefore, we should propose a new approach, and our basic architectural idea is shown in Figure 1. The purpose is to take the innovative design concept as a precursor and guide students to form their own innovative consciousness.

The visual focus is also known as the visual center, which is different from the center in the geometric sense. We draw a rectangle, use the eye's measurement to find the center of the rectangle, and draw a point there, which is the "visual center." Two diagonals of the rectangle and a point at their intersection are drawn, which is called the "geometric center." At this point, we will find that the visual center is a little higher than the geometric center, which means that when we read the picture, we will first focus on the visual focus and then follow the direction and strength of the image to develop the process of sight.

## 2. Related Work

The purpose of art and design education is to cultivate high-quality, comprehensive design and satisfy the needs of the

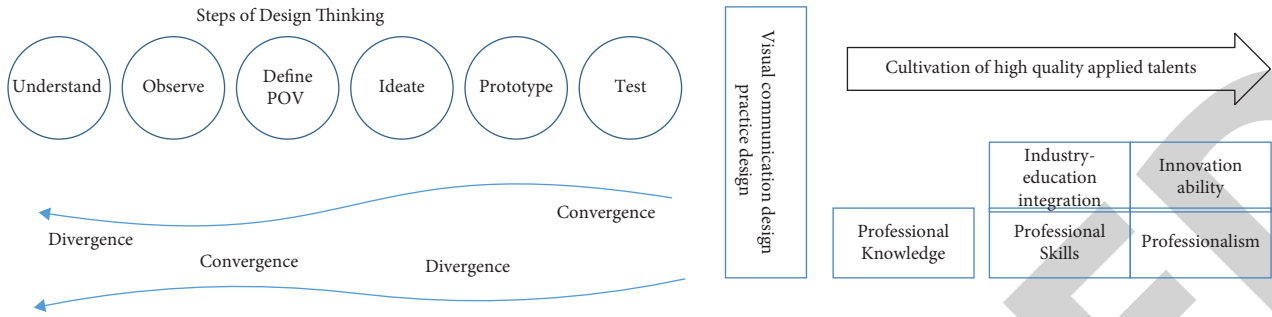


FIGURE 1: Innovative thinking in visual communication design courses.

market [10]. Traditional teaching mode cannot meet the supply and demand of talents in society, and it should take into account the theory and cultural heritage and practice, dig deeper into Chinese culture, and deepen students' knowledge of the profession; the faculty should not be single, but should establish a team of teachers, and at the same time focus on academic exchange and integration and urge teachers to carry out curriculum reform according to today's social talent needs and new training methods.

The course content includes VI design, advertising design, printing design, design demonstration, etc. The traditional visual communication scheme cannot meet the needs of students, and the technical and practical courses of digital media are still insufficient. Second, the visual communication specialty lacks a systematic and continuous teaching system, the curriculum connection is insufficient, there is a gap between the two, and students lack learning opportunities for practical skills. In the new era, students need to acquire more and more new knowledge, but the learning time is getting shorter and shorter, resulting in students having too much unified thinking, which will only increase the content of postsecondary courses to a certain extent. The increase of classroom content and the shortening of teaching time have a serious impact on the teaching direction, causing students to think about time design and be nervous to a certain extent. The increase of classroom content and the shortening of teaching time have a serious impact on students' teaching direction, leading to the belief that students think less and less about design, resulting in their lack of comprehensive design ability and creative thinking, and confusion about students' professional growth in the future.

Creative thinking is the most basic requirement for visual communication design majors, and the new era is mainly based on the development of modern information technology; how to carry out the integration of aesthetics and technology is an important problem faced by students of visual communication art and design in colleges and universities. Nowadays, many colleges and universities still adopt the previous teaching form and still carry out teaching work with the exclusive indoctrination teaching method, teachers only teach themselves on the podium, regardless of whether students master and understand, and most colleges and universities do not pay attention to stimulating teaching methods, such as contextual teaching, discussion teaching, and practical teaching, which to a certain extent hinders the

development of visual communication design students [11]. Visual communication design is a profession with strong practicality and innovation, and if the old ideas and concepts are not abandoned, then it will have a great impact on the cultivation of professional talents and will seriously restrict the progress and development of students [12]. In the teaching reform, teachers should not only optimize and update theoretical teaching contents but also innovate teaching methods to promote students' comprehensive and integrated growth and continuously cultivate their innovation and practical ability [13].

Creative thinking is the most important requirement in the field of visual communication design. How to realize aesthetics and integration technology is an important topic faced by the college of visual communication art and design. At present, many universities still use the previous teaching forms and continue to carry out teaching work in an extremely considerable way. Whether teachers master it or not, they will study in the department by themselves. However, most universities do not pay attention to this stimulating teaching method as teaching for specific situations, discussion teaching, practical teaching, etc. To some extent, it hinders the development of visual communication of design students [11]. Visual communication is a practical and innovative profession. If we do not abandon the old ideas and concepts, then it will have a great impact on the cultivation of professional talents and seriously restrict the progress and development of students [12]. As a part of educational reform, teachers should not only optimize and update the theoretical teaching content but also innovate teaching methods, promote the comprehensive growth of students, and constantly develop their creativity and practical ability [13].

The teaching mode is closely connected with the teaching effect and talent cultivation, and the advanced or not of the teaching mode directly affects the classroom effectiveness and indirectly affects the cultivation goal [14]. Teaching mode is a kind of teaching system and form, in which teaching contents, concepts, and methods are integrated with each other. In the present time of rapid development of information technology, advanced technical means should be fully used to assist teaching, innovate teaching tools, and methods, so as to enrich classroom contents, increase teaching resources, and improve teaching results [15]. First, as a visual communication platform, the new era can help teachers and students understand the development trend of

the design industry; second, the relatively mature technology in the new era has been effectively integrated into the visual communication curriculum, which is an indispensable help for students' learning and practice [16]. The communication application in the new era has broken the space limitation of the development and teaching mode of visual communication mode, improved students' learning intention, and optimized the visual communication method of curriculum design [17].

The amount of information transmitted is very small and too single, so people cannot watch and think slowly, but in the past, it cannot meet the needs of today's huge amount of information in one form and one way of expression, and it is more selective and effective [18]. From the era of black and white print information to the era of digital media, people's lives have changed dramatically, and in the new era, a cell phone can do shopping, chatting, reading, entertainment, communication, and other functions [19]. The traditional print media is gradually replaced by the new era, which can be used to show more diverse content that the design wants to express. VR virtual media, 3D media, etc. are all new technologies that need to be applied to visual communication design today, and the communication mediums that keep up with the times bring new progress and development to the visual communication design classroom [20].

### 3. Methodology

The curriculum construction and analysis of visual communication design are carried out to obtain the feature vector function of the visual communication design curriculum. Among them, some of the feature courses have unreasonable status, and the remaining courses have certain noise components, which also have an impact on the feature courses. The value of the relationship between visual communication design courses and feature courses is  $x$  ( $x = 1, 2, \dots, N$ ), which is calculated by the following equation:

$$\mu(i) = \frac{\sum_{j=1}^{2N-1} R_{IMF_i}(j)R_x(j)}{\sqrt{\sum_{j=1}^{2N-1} R_{IMF_i}^2(j)\sum_{j=1}^{2N-1} R_x^2(j)}} \quad (1)$$

The random variables of the visual communication design course extracted using linear analysis. First, two random variables are set as  $X$  and  $Y$ , and there is a certain correlation between them. The relationship between the known random variable  $X$ , the visual communication design course feature variable  $HY/X$ , and the unconditional visual communication design course feature variable  $H(Y)$  is represented as  $H(Y) \geq H(Y/X)$ . The equation of the relationship between the two random variables is as follows:

$$I(Y; X) = H(Y) - H(Y/X). \quad (2)$$

Let the  $D$ -dimensional space of sample information of  $n$  visual communication design courses be  $X = [x_1, x_2, \dots, x_n]$ , the corresponding feature course matrix be

$Z = [z_1, z_2, \dots, z_n]$ , and ( $d = D$ ) be the corresponding feature course  $d$ -dimensional vector  $z_i$  ( $1, 2, \dots, n$ ). The corresponding feature course matrix is  $Q$ , where the equation of the feature course  $q_{ij}$  is as follows:

$$q_{ij} = \begin{cases} \exp\left(\frac{-\|x_i - x_j\|^2}{t}\right), & \|x_i - x_j\|^2 < \varepsilon, \\ 0, & \text{otherwise,} \end{cases} \quad (3)$$

where the two adjacent feature courses are  $x_i, x_j$ , the constant is  $t$ , and the very small constant is the threshold  $\varepsilon$ . When  $\varepsilon > 0$ , the solution for the visual communication design course is as follows:

$$\operatorname{argmin}_W \sum_{ij} (W^T x_i - W^T x_j) q_{ij} = \operatorname{argmin}_W W^T X L X^T W = \lambda X D X^T W. \quad (4)$$

Among them, the characteristic course  $d_{ij} = \sum_j q_{ij}$  can reflect the frequency of visual communication design course distribution. At this time, the characteristic course variation matrix is  $W$ , which is obtained through the characteristic decomposition:

$$X L X^T W = \lambda X D X^T W, \quad (5)$$

where the singularities of the course feature matrix  $X D X^T$  can be mapped to the PCA feature space for singular feature elimination, and the course feature information is obtained as follows:

$$\begin{cases} x \longrightarrow z = W^T x, \\ W = W_{PCA} W_{LPP}. \end{cases} \quad (6)$$

Based on the obtained change matrix of course information,

$$y_i = b_0 + \sum_{j=1}^k b_j x_j, \quad (7)$$

where the course information is  $b_0, b_j$ . The visual communication design course feature vector is obtained by the above model feature extraction as follows:

$$Y = (y_1, y_2, \dots, y_i, \dots, y_k). \quad (8)$$

The state variable of the visual communication design course is chosen as  $x$  and the feature course variable is  $y$ . The spatial expression of the state model of visual communication design is constructed as follows:

$$\begin{cases} \dot{x} = Ax + Bu, \\ y = Cx + Du, \end{cases} \quad (9)$$

where  $x$  denotes the characteristic course stability parameter,  $u$  denotes the vector of characteristic course parameters of the  $r$ -dimensional model,  $y$  denotes the vector factor in the  $m$ -dimensional model,  $A$  is the  $n \times n$  order matrix in the

visual communication design state model, the  $n \times r$  order factor matrix output by the system course identification instrument is  $B$ ,  $C$  is the  $n \times m$  order matrix output by the actual vector, and  $D$  is the  $m \times r$  order gap matrix in the system model.

The visual communication design state space is described using the random matrix analysis method, that is,

$$(t = 1, 2, \dots, T). \quad (10)$$

Let the parameter matrix  $A$ , which undergoes change, and the course change in the change matrix  $C$  is  $I_m \Delta c_{nm}$ . In summary, the equation of state is derived as follows:

$$\begin{aligned} \tilde{x} &= A\tilde{x} + Bu + I_i \Delta a_{ij} \tilde{x}_j + B_1 d, \\ \tilde{y} &= C\tilde{x} + Du + I_m \Delta c_{nm} \tilde{x}_n + D_1 d. \end{aligned} \quad (11)$$

Here, the  $j$ th irrational state vector of the irrational state vector  $\tilde{x}$  is  $\tilde{x}_j$ ,  $I_i$  is the same matrix, in which the visual communication design is located, and  $I_m$  indicates that the matrix vector of  $\tilde{y}$ .

The residual  $r(t)$  is as follows:

$$r(t) = \tilde{y}(t) - \tilde{Y}(t). \quad (12)$$

The residual threshold is as follows:

$$J_t = \mu(u_j, t_k) \pm 2.05\sigma^2(u_j, t_k). \quad (13)$$

Assuming that the visual communication design course feature vector and the visual communication design course feature vector have been monitored so far, then the  $y^i$  difference in the  $k$ th feature vector is obtained as follows:

$$\Delta_{ij}(k) = |y_i(k) - x_j(k)|. \quad (14)$$

With equation (14), the random matrix spectrum is obtained using the following equation:

$$V|y_i(k) - x_j(k)| = \frac{\Delta_{ij}(\min) + a\Delta_{ij}(\max)}{\Delta_{ij}(k) + a\Delta_{ij}(\max)}, \quad (15)$$

where the environmental parameters of the visual communication design course are  $\Delta_{ij}(\min)$ ,  $\Delta_{ij}(\max)$ , and the discrimination coefficient of the course is  $a$ .

Based on equation (15), the gray random matrix spectrum is constructed using the following equation:

$$\Gamma = \begin{bmatrix} V(y_1, x_1) & V(y_1, x_2) & \cdots & V(y_1, x_s) \\ V(y_2, x_1) & V(y_2, x_2) & \cdots & V(y_2, x_s) \\ \vdots & \vdots & \ddots & \vdots \\ V(y_m, x_1) & V(y_m, x_2) & \cdots & V(y_m, x_s) \end{bmatrix}. \quad (16)$$

Let it be known that the visual communication design course pattern is  $Y = \{y_1, y_2, \dots, y_m\}$  and the course feature vector is  $T = \{t_1, t_2, \dots, t_n\}$ , then the affiliation degree of the  $j$ th class of visual communication design course index of the  $i$ th class is  $r_{ij}$ , and using the following equation to normalize the affiliation degree of the visual communication design course, we get the following equation:

$$\sum_{j=1}^n r_{ij} = 1. \quad (17)$$

Using equation (17) as the basis, the relationship matrix of visual communication design is derived. The individual affiliation vectors are derived using the following equation:

$$B = [U_1, U_2, \dots, U_n]^T. \quad (18)$$

The following equation was used to find the closeness of identification model to the standard model:

$$W(R, B) = \frac{\sum_{j=1}^n (\eta_j \wedge U_j)}{\sum_{j=1}^n (\eta_j \vee U_j)}. \quad (19)$$

By comparing the closeness of visual communication design courses, the maximum value is selected as the course information, so as to complete the study of the construction method of visual communication design courses:

- (1) At a certain time point  $t$ , the  $N$  sampled data in the system can be arranged as an  $n$ -dimensional vector,  $x_i \in R^N$ .
- (2) The system data sampling time  $T$  is long enough to extend  $X_t$  in time to form a database  $\Omega \in R^{N \times T}$ .
- (3) The sampled data for any time period ( $t = 1, 2, \dots, T$ ) can be described as follows:

$$X_n = [x_1, x_2, \dots, x_T]. \quad (20)$$

Based on the above method, the actual system is transformed into a random matrix model by sampling the data.

## 4. Experiments

The efficiency of the three course design methods was tested with the number of sample data as the independent variable, and the results are shown in Figure 2.

With the gradual increase of the number of visual transmission course samples and the change of the design coefficients of the three course development methods, the course design is designed based on the random matrix analysis of the visual transmission spectrum. The maximum calculation rate is 98% [5]. In curriculum design, the maximum development rate is 74%, while in curriculum design, the maximum development rate is 41% [6], which shows that the visual transmission method based on random matrix analysis is much higher than the design of the other two courses.

In order to further verify the curriculum development method based on random matrix spectroscopy analysis, the effectiveness of the method is tested by analyzing examples under different intensities, as shown in Figures 3–5.

As shown in Figures 3–5, when the intensity of the visual transmission process is 50%, the residual value obtained is relatively high, so it is difficult to achieve an effective process design, because the visual transmission process cannot be detected in the process of designing the peak value of burst

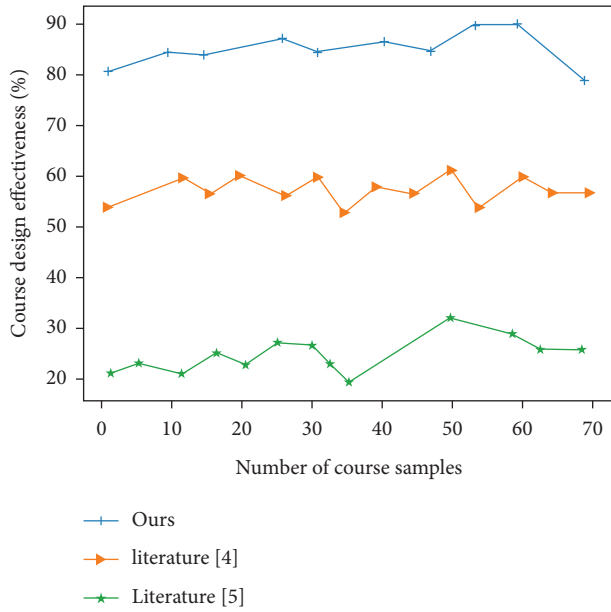


FIGURE 2: Results of course design effectiveness test.

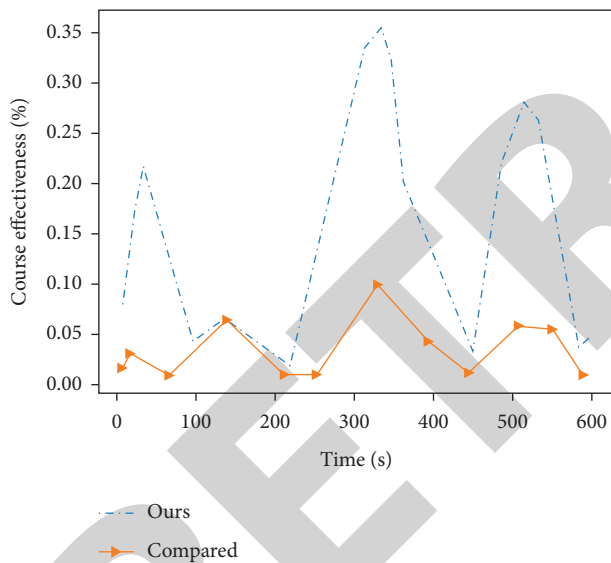


FIGURE 3: Course test results with a course intensity of 40%.

signal, while the visual transmission intensity is 30%, and the result is relatively small. The visual transmission analysis is a random matrix spectrum designed for the training course, which can be effectively designed for visual transmission with high intensity.

In order to further verify the effectiveness of the proposed method, the method of determining the number of courses in this study is compared with the actual number of the above four courses, as listed in Table 1. The analysis of the results in Table 1 shows that the result of this course rate determination method is very close to that of the ideal course specification, which proves the effectiveness of the method proposed in this study and the effective development of this method.

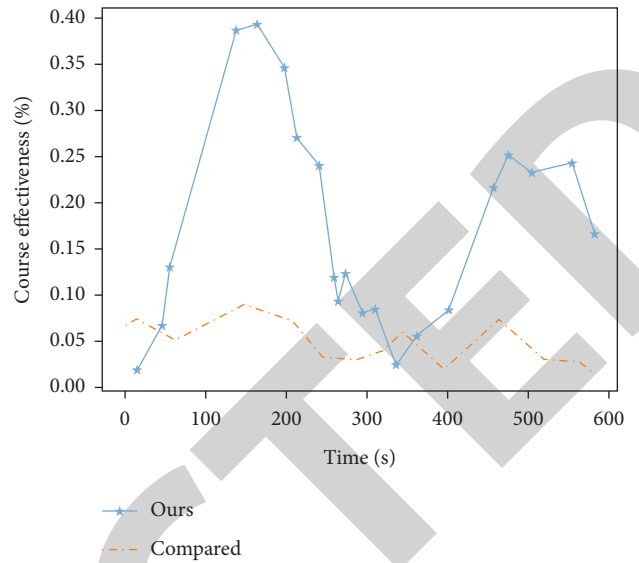


FIGURE 4: Course test results with a course intensity of 50%.

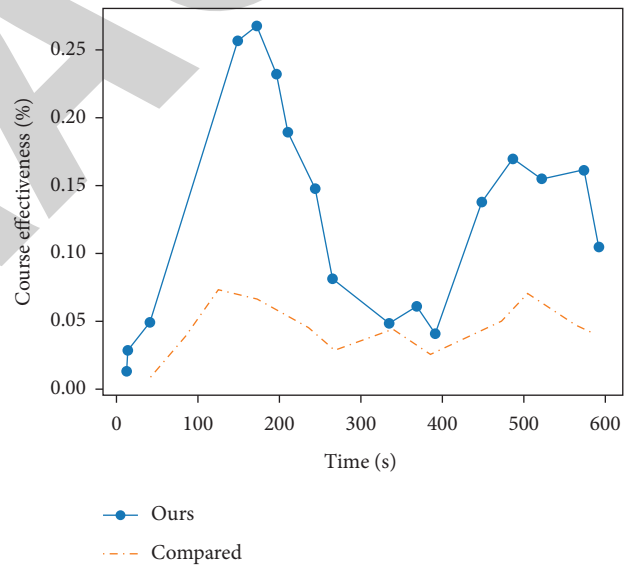


FIGURE 5: Course test results with a course intensity of 30%.

TABLE 1: Course rate identification results of this method (%).

Identification times (times)	Rate recognition of the proposed method	Ideal rate recognition
20	96	97
40	96	96
60	96	94
80	98	97
100	94	98

In order to compare the distribution of different curriculum construction, we have done further experiments to analyze, and the specific results are shown in Figure 6.



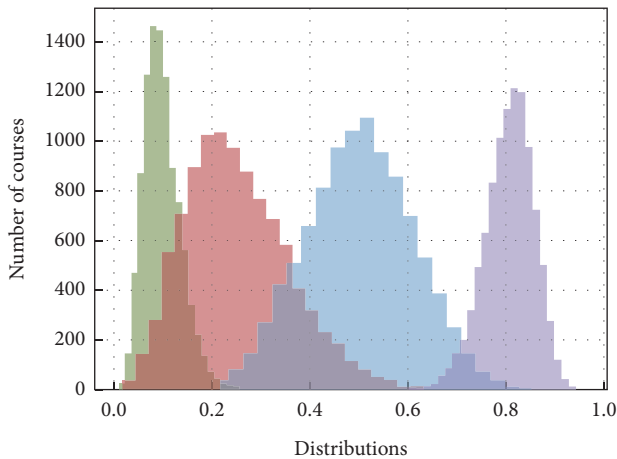


FIGURE 6: Comparison of the distribution of curriculum construction.

## 5. Conclusion

In summary, China is gradually entering a new era characterized by high technology, high quality, and fast interconnectivity, which not only brings space to the field of visual communication but also presents new challenges for visual communication teaching. The application of relevant technologies in visual communication design methods can not only convey the main objectives of the message but also effectively improve students' learning performance. Comparing the method of determining the number of courses in this study with the actual number of the four courses mentioned above, the visual communication analysis is a random matrix spectrum designed for training courses that can be effectively designed for high-intensity visual communication, proving the validity of the method proposed in this study and the effective development of the method. Teachers should constantly reform and learn new teaching models, contents, and systems, optimize teaching conditions and quality, find new starting points, combine traditional teaching methods with education, form knowledge visual transfer skills adapted to the new era, develop students' career orientation, and improve their employment competitiveness.

## Data Availability

The datasets used in this study are available from the author upon request.

## Conflicts of Interest

The author declares that they have no conflicts of interest.

## Acknowledgments

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