Scholar Publishing Group
International Journal of Educational Innovation and Science
https://doi.org/10.38007/IJEIS.2020.010203
ISSN 2789-7184 Vol. 1, Issue 2: 23-39

Interactive Calligraphy Virtual Teaching Evaluation Scale Based on Educational Psychology

Bohai Zhang*

Department of Physical Education, North Sichuan Medical College, Nanchong, Sichuan 637000, China

**corresponding author*

Keywords: Interactive Calligraphy, Educational Psychology, Virtual Teaching, Evaluation Scale

Abstract: Calligraphy is a treasure of traditional Chinese culture and should be promoted and taught in primary and secondary education. Calligraphy training for primary and secondary school students can cultivate students' good writing habits and improve their writing ability. It can also cultivate students' understanding of Chinese culture. In traditional calligraphy education courses, students adopt a specific copybook mode from the very beginning, which often goes against the students' real wishes and leads to students' laziness in learning calligraphy. According to the teaching method of teaching students in accordance with their aptitude and the principle of active natural aesthetic education, this paper introduced the interactive teaching method into the calligraphy teaching method. Based on educational psychology, students were taught in the form of virtual teaching. Around this teaching mode, this paper sorted out a teaching evaluation scale under this mode, and conducted an empirical analysis. It was practiced in two primary schools A and B. Among the 40 calligraphy lessons, there were only 2 calligraphy lessons in School A, which was based on the interactive virtual teaching of calligraphy based on educational psychology, which was relatively poor in the implementation of classroom teaching, but the overall level of classroom teaching was still relatively good. From the overall observation results, it can be seen that the scores of School B under the traditional teaching mode were lower than those of School A in all aspects, especially in the process of teaching activities, the average score of class A was 6.4 higher than that of class B. It can be seen that the interactive calligraphy virtual teaching based on educational psychology had certain advantages in practical application.

1. Introduction

With the development of the times and the development of science and technology, in the process of gradual evolution, a new teaching method has emerged, that is, interactive learning. On the basis of traditional teaching methods, it pays more attention to the method of teaching through

communication. This teaching method changes the "teaching" method of existing teachers, and pays more attention to the "learning" state of students. It creates a pragmatic, positive learning environment that enables students to learn meaningfully. With the continuous development and improvement of virtual reality technology, many fields have begun to integrate and explore the application of virtual technology. Even in education, virtual education is beginning to mature. Therefore, when a new teaching method emerges, no matter how novel it is, the quality of its teaching method is paramount. In studying the evaluation of classroom teaching methods, a set of teaching relationships within the classroom is involved. A comprehensive study of the theoretical performance of classroom professors can reveal the importance of classroom teaching and better understand the characteristics of classroom teaching. By combining the existing theoretical progress, a new qualitative teaching view is established to replace the existing qualitative view of classroom teaching. Based on this theory, the related issues of classroom teaching evaluation and the adoption of new qualitative teaching methods are discussed. This is of great significance for improving the research on teaching theory and promoting scientific research on teaching theory.

Although the discussion of relevant assessment issues in the classroom may not be fully applicable to general education evaluation, through micro-exploration of these issues, the solution of the above problems would definitely have a positive impact on the development of general education. Therefore, this paper used literature analysis technology, text analysis technology and classroom observation technology to analyze the research based on educational psychology theory when researching the interactive calligraphy virtual professor evaluation scale.

2. Literature Review

As an art inherited from ancient times, many scholars have done a lot of research on calligraphy. Chang L proposed an RF-based Chinese calligraphy template, named RF-Copybook, which can improve learners' imitation behavior by precisely monitoring learners' writing process and providing detailed instructions [1]. Fei C proposed a robotic calligraphy system. The system first used human arm gestures to build a font library of basic strokes of Chinese characters and English words; then the system used the created database and gestures to write Chinese characters and English words. In addition, Fei C also deployed a 3D motion sensing input device to capture human arm trajectories for building font databases and training classifier ensembles [2]. Loup-Escande E studied how the learning of handwriting and calligraphy were enhanced by supplementing sensory feedback. Appropriate visual, auditory or proprioceptive feedback can be achieved through emerging technologies such as mixed reality devices [3].

With the continuous development and improvement of virtual reality technology, this technology has been used in many aspects, among which virtual education has been focused on by many scholars. Mayne R saw virtual reality (VR) as an emerging technology that offers exciting prospects for teaching, especially in imparting practical skills. Mayne R also documented a multidisciplinary experimental study [4]. Fu-Ping used Proplan virtual software to build a virtual teaching platform for orthognathic surgery and explores an effective teaching model for orthognathic surgery [5]. Carlos had created a practical training environment for pneumatic process simulation and control for automation industrial process engineering students. It utilized a virtual environment to transmit instructions for controlling the real FESTO pneumatics laboratory based on student development in the virtual classroom. This provided and facilitated new ways for students and teachers to accelerate the learning process [6].

Meanwhile, in educational psychology, many people have done a lot of research in this field. Bailey J H had studied the psychology of education that underlies the categories of learning that occur in clinical settings, and Bailey J H believed that understanding this was critical to creating

opportunities for learners to activate their knowledge base at the precise time of appropriate application [7]. Ibrahim examined the impact of flipped classroom (FC) on overall learning in undergraduate educational psychology courses. Ibrahim also studied FC learning at different learning levels in the Bloom taxonomy (BT) [8]. Boyle believed that the focus on school psychology issues was its salient feature, and Boyle was committed to improving the practice and research knowledge of educational and developmental psychology [9]. Grimmelikhuijsen S discussed how public administration scholars currently draw on theories and methods from psychology and related fields, and Grimmelikhuijsen S noted that public administration research could benefit from further integration [10]. But in the field of educational psychology and virtual teaching of interactive calligraphy, many scholars' research was not in-depth and comprehensive. Therefore, this paper studied the interactive calligraphy virtual teaching evaluation scale based on educational psychology, and this paper also expanded and innovated it on the basis of a large number of scholars.

3. Evaluation Method of Interactive Calligraphy Virtual Teaching Evaluation Scale

3.1. Interactive Calligraphy Teaching Plan

This paper takes Chinese characters as the object to design an interactive calligraphy teaching program. Chinese characters are written symbols used to record Chinese sentences [11]. For Asian learners who belong to Chinese culture, learning Chinese characters is relatively easy. Because their own culture has a certain relationship with Chinese culture, Chinese characters are not completely unfamiliar to them. For European and American learners, Chinese characters as an ideogram are a completely unfamiliar writing system. There is no concept of stroke order, structure, and how to make Chinese characters, which makes learning very difficult [12]. Therefore, for European and American learners, Table 1 introduces the interactive plan of the Chinese character part in detail, including: knowledge of Chinese characters, online teachers introduce the structural characteristics of Chinese characters, the construction of Chinese characters, knowledge of Chinese characters culture and other knowledge content to learners, and online teachers provide learners with a rational understanding of Chinese characters. This program can adopt operational interaction; display of stroke order and structure of Chinese characters, this part gives learners a perceptual understanding of the structure and stroke order of each specific Chinese character. This program can also adopt operational interaction, which like the introduction of Chinese character knowledge; practice of calligraphy, this is an immersive interaction, which can be achieved through animation, handwriting recognition, etc., and it requires learners to have a high level of participation in interactive activities; calligraphy strategy learning, it includes inquiring about unrecognized Chinese characters, comparing the shape of Chinese characters, etc., and learners conduct constructive interaction [13].

Table 1. Interactive scheme of Chinese calligraphy

Interactive activities	Type of interaction	Interactive control level	
		Asian learners	European and American learners
Chinese character explanation	Operational interaction	Teacher control	Teacher-directed learner control
Chinese character stroke order and structure display	Operational interaction		
Calligraphy practice	Immersive interaction		
Learning calligraphy strategies	Constructive interaction		

It is combined with the new situation of Chinese calligraphy education, this research attempts to apply the interactive teaching method to calligraphy education. It also compared with the traditional teaching method to explore the educational effect.

Research objects

When designing the interactive teaching mode, the research objects of this paper are two classes of the same level (the first four-year class and the second four-year class) in the fourth grade of a township primary school. The first four-year class is an experimental class, with 20 boys and 16 girls, and a total of 36 students; the second four-year class is a control class, with 15 boys and 20 girls. The calligraphy teaching of the two classes is held by the same teacher, and the students have never participated in the calligraphy tutoring class, and the students have the same level of cognition and interest in calligraphy.

Research tools

The interactive teaching mode is implemented for the experimental class, and the teaching process is divided into four stages as shown in Figure 1: observation stage, experience stage, performance stage, and ascension stage.

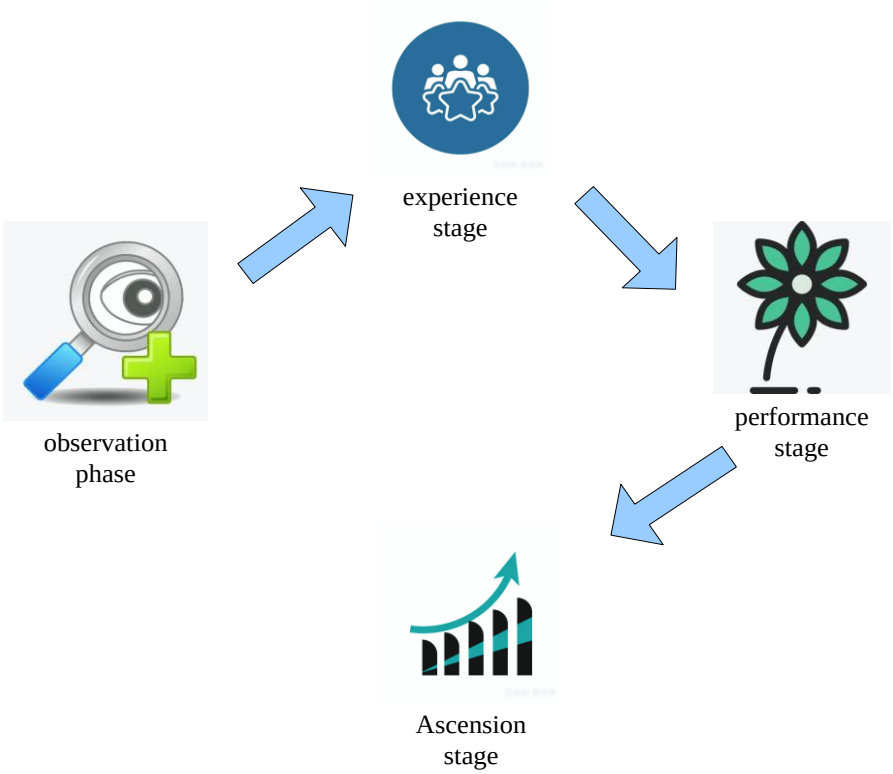

Figure 1. The four stages of the teaching process

The teaching process is completed through six steps, as shown in Figure 2: providing self-help sheets for learning, demonstration of micro-vision techniques, one-on-one tutoring for students to experience writing, proposition creation, work evaluation, and extracurricular reading.

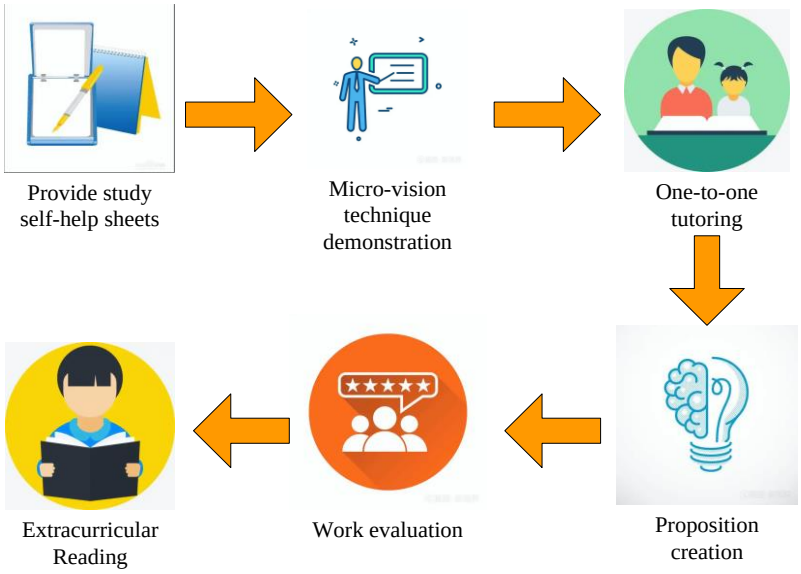

Figure 2. Teaching method steps

Before the experiment, a questionnaire survey was conducted on the experimental class and the control class respectively. The purpose of the first questionnaire was to understand the students' calligraphy level and interest in calligraphy learning, and the second questionnaire was to understand the practical application effect of interactive teaching methods in calligraphy classroom teaching. The questionnaire was simple and clear for students to read.

At the end of a teaching stage, students were assigned to choose the brushwork, font and writing that they were best at for evaluation. At the same time, three different calligraphy teachers were selected from the school to score the calligraphy works, and finally it was examined whether there is a significant difference between the mean scores of the two classes.

(1) Teaching process

For the control class, the general calligraphy teaching process was adopted. Teachers designated copybooks for students, mainly in Tang Kai, and taught students to learn how to hold a pen, start a pen and arm. Teachers made standardized requirements according to students' preferences to ensure that students can learn and write normally. In the teaching process, attention was paid to the role of demonstration. By reproducing the writing process, students can improve their overall grasp of calligraphy.

The teaching progress of the experimental class was the same as that of the control class. On the basis of ensuring the correct way of sitting, writing and writing, students were educated according to the interactive teaching theory. The 6 teaching method steps shown in Figure 2 were adopted, wherein each step corresponds to an interactive teaching mode, as shown in Table 2.

Table 2. Interaction patterns of teaching methods

Teaching steps	Interactive teaching mode
Provide learning self-help sheets	Adaptive interaction
Micro-vision technique demonstration	Comprehensive interaction
One-to-one tutoring with teachers	Operational interaction
Proposition Creation	Operational Interaction
Work Evaluation	Reflective Interaction
Extracurricular Reading	Optional Interaction

3.2. Interactive Calligraphy Virtual Teaching Design

When designing virtual teaching, students and teachers should be able to fully interact. This paper used the technology of human-computer interaction to illustrate some of the design methods adopted in this study.

(1) Invariant moment

Moment invariant is a feature of highly focused images, and has various distortion invariants such as translation, grayscale, scale, and rotation, so it is widely used in image pattern recognition, image classification, object recognition, scene analysis and other fields [14].

In the basic theory of invariant moments, it is assumed that $f(x,y)$ is a digital image function, the $(a+b)$-order ordinary moment of $f(x,y)$ can be defined as:

$$k_{ab}=\sum_{x}\sum_{y}x^{a}x^{b}f(x,y)\quad a,b=0,1,2... \tag{1}$$

The $(a+b)$-order central moment of $f(x,y)$ is defined as:

$$\delta_{ab}=\sum_{x}\sum_{y}(x-\bar{x})^{a}(y-\bar{y})^{b}f(x,y) \tag{2}$$

Among them, $\bar{x}=k_{10}/k_{00},\bar{y}=k_{01}/k_{00},a,b=0,1,2,\Lambda$

The normalized central moment can be further obtained as:

$$\beta_{ab}=\delta_{ab}/\delta_{00}^{r} \tag{3}$$

Among them, $r=(a+b)/2+1,a+b=2,3,\Lambda$

(2) Zernike moment

Zernike moments are orthogonal moments. It has been successfully applied to pattern recognition and image analysis due to its excellent noise immunity, rotational invariance, and ability to describe patterns in multi-scale analysis [15].

The set of orthogonal polynomials used by Zernike is a completely orthogonal set on the unit circle. Denoting this set of polynomials as $\{U_{nm}(x,y)\}$, this polynomial has the form:

$$U_{nm}(x,y)=U_{nm}(\mu,\eta)=R_{nm}(\mu)e^{jm\eta} \tag{4}$$

In Formula (4): n is a non-negative integer; m is a positive or negative integer, and the $n-|m|=$ constraint is even. $|m|\le n;\mu$ is the length from the origin to the (x,y) vector; η is the angle between the μ and x axes in the counterclockwise direction.

$R_{nm}(\mu)$ is a radial polynomial, which is defined as:

$$R_{nm}(\mu)=\sum_{W}^{\frac{n-|m|}{2}}\frac{(-1)^{W}(n-w)!\mu^{n-2w}}{\frac{W!(n+|m|)}{2}-\frac{W!(n-|m|)}{2}-W!} \tag{5}$$

$R_{n,-m}(\mu)=R_{nm}(\mu)$ is known from Formula (5), so these polynomials are orthogonal. Furthermore, they satisfy:

$$\iint_{x^2+y^2\le 1}[U_{nm}(x,y)]^* U_{ab}(x,y)dxdy=\frac{\pi}{n+1}\varsigma_{am}\varsigma_{bn} \quad (6)$$

Among them, when $a=b$, $\varsigma=1$; in other cases, $\varsigma=0$, $[U_{nm}(x,y)]^*$ represent the complex conjugate of $U_{nm}(x,y)$.

The moment is the projection of the image function on this set of bases, and there are m representations of the n th Zernike moment, which has no meaning outside the unit circle [16]. The representation of the Zernike moments of a continuous image $f(x,y)$ is:

$$Z_{nm}=\frac{a+1}{(N-1)^2}\sum_{x=0}^{N-1}\sum_{j=0}^{N-1}R_{nm}(r_{xy})e^{jb\eta_{xy}}f(x,y) \quad (7)$$

Among them, $r_{xy}=\sqrt{(\frac{2}{N-1}x-1)^2+(\frac{2}{N-1}y-1)^2}$, and $0\le r_{xy}\le 1,\eta=\tan^{-1}(\frac{2y-N+1}{2x-N+1})$.

What need to be noticed is that $Z_{nm}{}^*=Z_{n,-m},Z_{nm}$ is the complex conjugate of $Z_{n,-m}$. If it is necessarily to calculate the Zernike moments of a given image, the geometric center point of the image must be used as the coordinate origin. All image pixels must fall within the unit circle $(x^2+y^2=1)$, and those outside the unit circle are not counted.

(3) Hidden Markov Model (HMM)

HMM is developed on the basis of Markov chain. Since the actual problem is more complex than described by the Markov chain model, the observed events go through a set of probability distributions rather than a one-to-one correspondence with states, this model called HMM [17]. The HMM can be described by the following parameters:

O: the number of Markov chain states in the model. It is noted that the O states are ρ_1,Λ,ρ_N, and the state of the Markov chain at time t is p_t. Obviously, p_t belongs to $(\rho_1,\rho_2,\Lambda,\rho_N)$.

P: the number of possible observations corresponding to each state. P observations are recorded as $U_1,\Lambda U_M$, and observations at time t are recorded as R_t, of which R_t belongs to $(U_1,\Lambda U_M)$.

γ: initial state probability vector, $\gamma=(\gamma_1,\Lambda,\gamma_N)$, among them,

$$\gamma_i=P(p_1=\rho_i),1\le i\le O \quad (8)$$

C: state transition probability matrix, among them,

$$c_{ij}=P(p_{t+1}=\rho_j|p_t=\rho_i),1\le i,j\le O \quad (9)$$

D: observation probability matrix, $D=(d_{jk})_{N\times M}$, among them,

$$d_{jk}=P(R_t=U_K|p_t=\rho_j),1\le j\le O,1\le k\le P \quad (10)$$

In this way, an HMMs can be written as:

$$\lambda=(O,P,\gamma,C,D) \quad (11)$$

Or it can be abbreviated as:

$$\lambda = (\gamma, C, D) \quad (12)$$

(4) Forward-backward algorithm

It is assumed given a sequence of observations V, $V = V_1, V_2, \Lambda, V_T$, and a model $\lambda = (\gamma, C, D)$, the probability that model λ leads to V can be expressed as $P(V/\lambda)$.

According to the composition of HMMs, the most direct way to obtain $P(V/\lambda)$ is as:

For a fixed state sequence $W = q_1, q_2, \Lambda, q_T$, there are:

$$P(V/W, \lambda) = \prod_{t=1}^{T} P(V_t / q, \lambda) = b_{q_1}(V_1) b_{q_2}(V_2) \Lambda \; b_{q_T}(V_T) \quad (13)$$

Among them,

$$b_{q_t}(V_t) = b_{jk} \left| q_t = \rho_j, V_t = Z_k, 1 \le t \le T \right. \quad (14)$$

For a given λ, the probability of generating a W is:

$$P(W/\lambda) = \gamma_{q_1} a_{q_1 q_2} \Lambda \; a_{q_{T-1} q_T} \quad (15)$$

Therefore, the desired probability is:

$$\begin{aligned} P(V/\lambda) &= \sum_{\text{ALL}\ W} P(V/W, \lambda) P(W/\lambda) \\ &= \sum_{q_1, q_2, \Lambda\ q_T} \gamma_{q_1} b_{q_1}(V_1) a_{q_1 q_2} b_{q_2}(V_2) \Lambda \; a_{q_{T-1} q_T} b_{q_T}(V_T) \end{aligned} \quad (16)$$

Obviously, the calculation amount of Formula (16) is very large, about $2TN^T$ orders of magnitude. When $N = 5, T = 100$, the computation amount reaches 10^{72}, which is totally unacceptable. In this case, a more efficient algorithm must also be sought to obtain $P(V/\lambda)$:

The forward variable is defined as:

$$\alpha_1(i) = P(V_1, V_2, \Lambda, V_t, q_t = \rho_i / \lambda), 1 \le t \le T \quad (17)$$

Then there are:

Initialization:

$$\alpha_1(i) = \gamma_i b_i(V_1), 1 \le i \le N \quad (18)$$

Recursive:

$$\alpha_{t+1}(j) = [\sum_{i=1}^{N} \alpha_t(i) a_{ij}] b_j(V_{t+1}), 1 \le t \le T-1, 1 \le j \le N \quad (19)$$

The end:

$$P(V/\lambda) = \sum_{i=1}^{N} \alpha_T(i) \quad (20)$$

Among them,

$$b_j(V_{t=1}) = b_{jk|V_{t+1}=U_k} \quad (21)$$

This algorithm greatly reduces the amount of computation and becomes $N(N+1)(T-1)+N$ multiplications and $N(N-1)(T-1)$ additions. Likewise, at $N=5, T=100$, only about 3000 computations (multiplications) are required.

3.3. Design of Interactive Calligraphy Virtual Teaching Evaluation Scale

When designing the interactive calligraphy virtual teaching evaluation scale, this paper mainly conducted in-depth research and design on the four aspects of teaching as shown in Figure 3, namely teaching activity goals, teaching process, teaching effect and teacher quality.

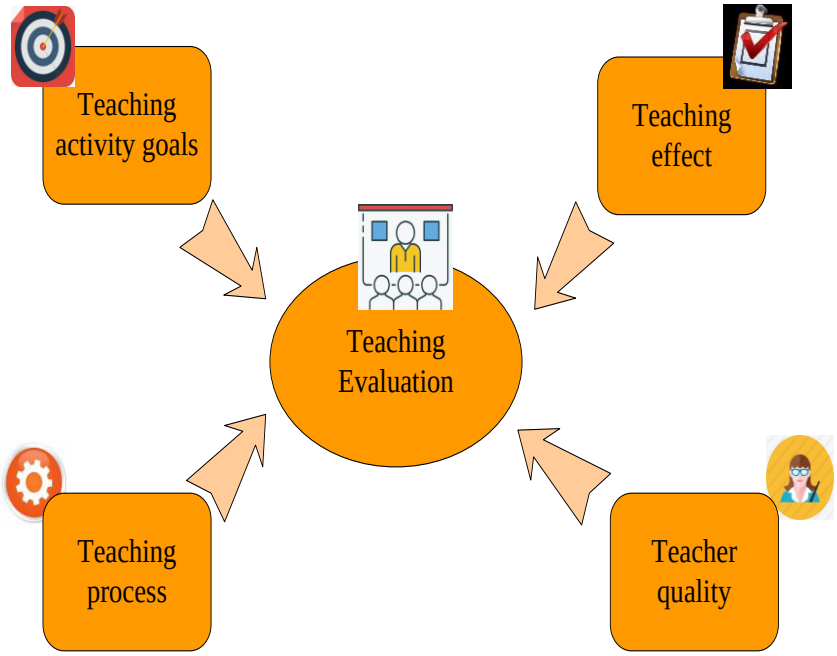

Figure 3. Contents of the teaching evaluation scale

(1) Objectives of teaching activities

The goal is the direction and expected result of teaching activities, and is the starting point and end point of all teaching activities [18]. Its writing should follow the basic concepts of the new curriculum and reflect the two major themes of "teaching" and "learning". Since students are the main body of learning, the determination of teaching objectives should consider inclusiveness. The clarity and expediency of teaching goals refers to taking students as the starting point and springboard. Emotions and attitudes should be comprehensively examined and utilized in the teaching process according to the cognitive and physiological level of the students. Students' existing knowledge, experience and abilities should be identified to accommodate individual differences in students.

(2) Process of teaching activities

The teaching activity process is mainly divided into three parts, as shown in Figure 4.

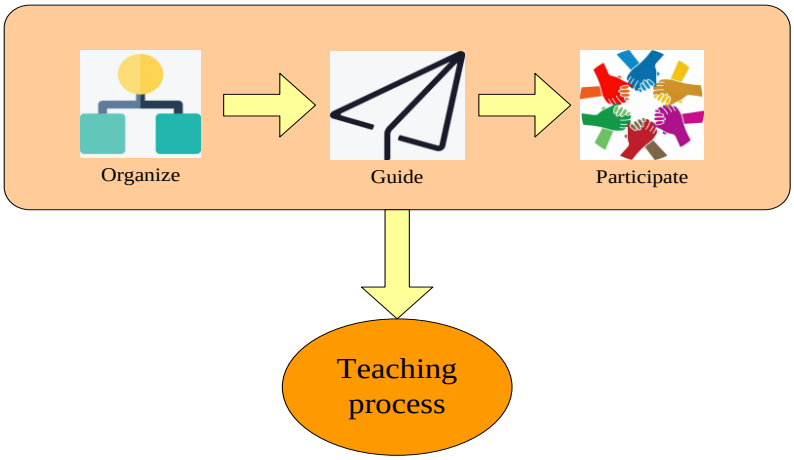

Figure 4. Contents of the teaching activity process

When organizing interactive calligraphy virtual education and teaching activities, the basic concepts of curriculum standards should be reflected first, and the classroom structure should be reasonable and clear. Finally, the organization of activities should be carried out in an orderly manner, the classroom should be democratic and open, teachers and students should interact, and students should interact.

In the educational process of guiding the virtual education of interactive calligraphy, it is necessary to use various educational media reasonably and skillfully, and operate them appropriately. It is necessary to focus on education, inspiration and outstanding effects, and effectively develop field resources. Attention is also paid to students' learning methods and process guidance, as well as extensive calligraphy learning. Multicultural background, cultivate students' aesthetic ability and cultivate humanistic spirit [19].

When participating in the interactive calligraphy virtual training teaching activities, students must have the enthusiasm and interest in learning calligraphy. All faculty members must not only actively participate and think positively, but also be able to ask meaningful questions, think independently, or express personal opinions. It is necessary to pay attention to the dual stance of students' willingness to cooperate, explore, learn by themselves, communicate, and fully practice. Only methods suitable for the age characteristics of students can be effective.

(3) Teaching effect

The requirements of the teaching effect are: students actively participate in calligraphy learning activities and have sufficient emotional experience; students at different levels have appropriate development; students' aesthetic taste is full of children's interests, emotional communication is pragmatic, and physical independence; exploratory and collaborative, learning is efficient and helps to enhance ability [20].

(4) Quality of teachers

When studying the traditional calligraphy teaching evaluation scale, teachers use standardized and beautiful writing and use standard characters, so that the language is suitable for the students' age, refined, rich, expressive, and the knowledge of calligraphy is more professional. Because the virtual teaching method is adopted, the quality of teachers in this aspect can meet the requirements [21].

(5) The score design of each section of the interactive calligraphy virtual teaching evaluation scale

According to the research on the above course concepts and the active absorption of the research results, a quantitative table that can quantify teaching evaluation is compiled. Figure 5 shows the

scores of each section.

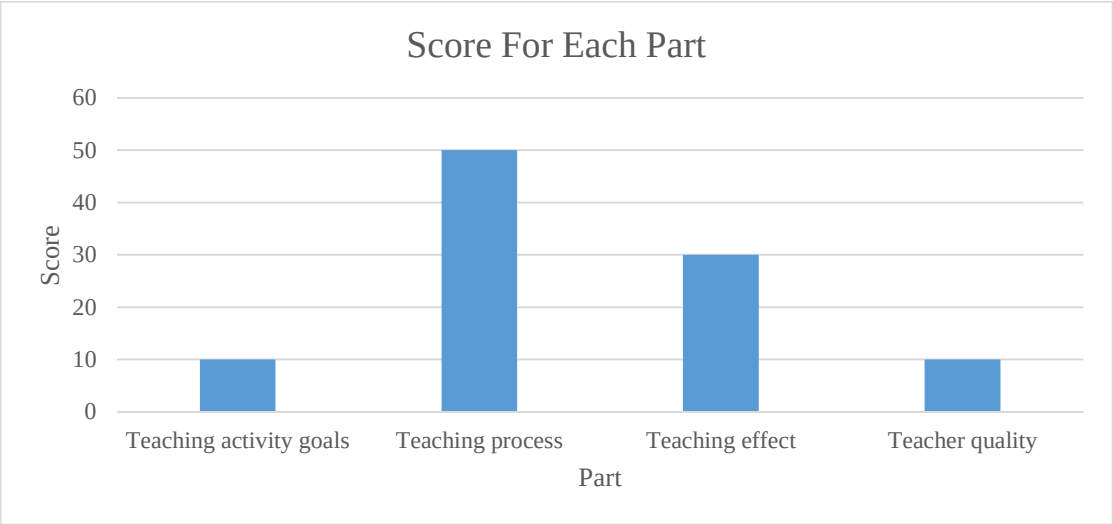

Figure 5. Scores of each teaching evaluation section

This paper adjusted the above data many times, and finally sorted out a more reasonable and scientific interactive calligraphy virtual teaching evaluation scale based on educational psychology, as shown in Table 3.

Table 3. Evaluation scale of calligraphy virtual teaching

Teacher			Class		Time			
Subject					Evaluator			
Evaluation item		Comment content				Standard score	Evaluation points	Total score
Teaching activity goals		1. Reflect the requirements of the new curriculum standard, conform to the actual situation of students, and combine knowledge and emotion, conclusion and process, teaching and educating people.				10		
Teaching process	Organize	2. The teaching activities reflect the basic concept of the curriculum standard, the classroom structure was reasonable, and the order was clear.				4		
		3. The teaching content was scientific and reasonable, connecting with the students' reality, and creatively handling the teaching materials				2		
		4. The activities are organized in an orderly manner, the lessons are democratic and open, the interaction between teachers and students, and the interaction between students and students.				4		
	Guide	5. Reasonable and proficient use of various teaching media, proper operation.				6		

		6. Facing the whole, pay attention to the characteristics and needs of each student, strive to create suitable activities and environments, and organize and guide effectively.	6		
		7. Pay attention to education, be full of inspiration, highlight practicality, and can effectively develop on-site resources.	8		
		8. Pay attention to the guidance of students' learning methods and processes, pay attention to students' learning of calligraphy in a wide range of cultural backgrounds, cultivate students' aesthetic ability, and cultivate their humanistic spirit.	6		
	Participate	9. Stimulate the motivation and interest of students in calligraphy learning. All staff take the initiative to participate and think actively. They can ask meaningful questions, think independently or express personal opinions.	6		
		10. Willing to cooperate, explore, learn independently, communicate, and fully practice.	6		
		11. Pay attention to the double posture of the students, the method was suitable for the age characteristics of the students, and it was effective.	2		
Teaching effect		12. Students' active participation and active participation in calligraphy learning activities. 13. The emotional experience was sufficient, and students of different levels get the development they deserve. 14. The aesthetic taste of the students was full of childlike interest, and the emotional communication was real and natural.	9		
		15. Self-directed, inquiring, cooperative learning, short-term and efficient, and enhanced ability. 16. Students can apply their knowledge in combination with practice, and they can gain something from good, medium, and poor.	8		
		17. Able to ask questions, express opinions, gain knowledge, and accumulate life experience.	6		
		18. Students have mastered the basic knowledge, basic skills, and good homework.	7		
Teacher quality		19. Write and use standard words, standard and beautiful.	4		
		20. Use Mandarin, the language was age-appropriate, refined, rich and expressive	3		
		21. Knowledge of calligraphy was more professional.	3		
Overall evaluation					

Table 3 is the teaching evaluation scale designed in this paper. The total score is 100 points, the teaching activity goal is 10 points, the teaching activity process is a total of 50 points, and the teaching effect is 30 points. In total, scores above 85 are regarded as excellent, 75 to 84 are regarded as good, 60 to 74 are regarded as passing, and less than 60 are regarded as failing.

4. Demonstration of Interactive Teaching Mode and Evaluation Scale

4.1. Demonstration of Interactive Teaching Mode

The distributed questionnaires were recovered and the number of recovered copies was counted. Among them, 71 questionnaires were actually distributed, and 36 questionnaires were distributed. After careful inspection, 70 valid questionnaires were recovered for questionnaire 1, and 35 for questionnaire 2. The recovery rates were 98.59% and 100%, and the questionnaires were valid. The questionnaire 1 was a test for students' hobbies and hobbies in calligraphy and the writing skills they had received.

The questionnaire mainly investigates the following items:

(1) Does the student have a certain understanding of calligraphy?

(2) Does the student like calligraphy?

(3) Has the student studied calligraphy?

(4) Does the student recognize the importance of calligraphy?

In this study, the answers to the four questions were divided into three types, A for "yes", B for "no", and C for "general" or "occasionally".

Questionnaire 1 was a test for students' interest in calligraphy and the writing skills they have received. A questionnaire survey was conducted on the experimental subjects before the experiment, and the statistical data comparative analysis was shown in Table 4.

Table 4. Analysis of pre-test data for experimental class and control class

Topic	Class	A	B	C
1	Class one	2	30	3
	Class two	1	32	2
2	Class one	3	18	14
	Class two	4	15	16
3	Class one	1	30	4
	Class two	1	29	5
4	Class one	10	5	20
	Class two	9	6	20

It can be seen that most of the students in the two classes had no knowledge of calligraphy, but most of them had a fond attitude towards calligraphy. At the same time, the students in the two classes had the same cognition and preference for calligraphy, indicating that interactive teaching practice can be carried out for the two classes [22]. In order to know whether the interactive teaching method plays a positive role in guiding students' calligraphy learning after a teaching stage of practice, a second questionnaire survey was conducted for the experimental class, and the survey results obtained are shown in Table 5.

Table 5. Post-test data analysis of the experimental class

Topic	A	B	C
1	33	0	2
2	30	2	3
3	35	0	0
4	29	3	3

Figure 6 shows the changes in the experimental class's understanding and liking of calligraphy before and after the interactive learning, that is, the changes in the number of people who chose

option A.

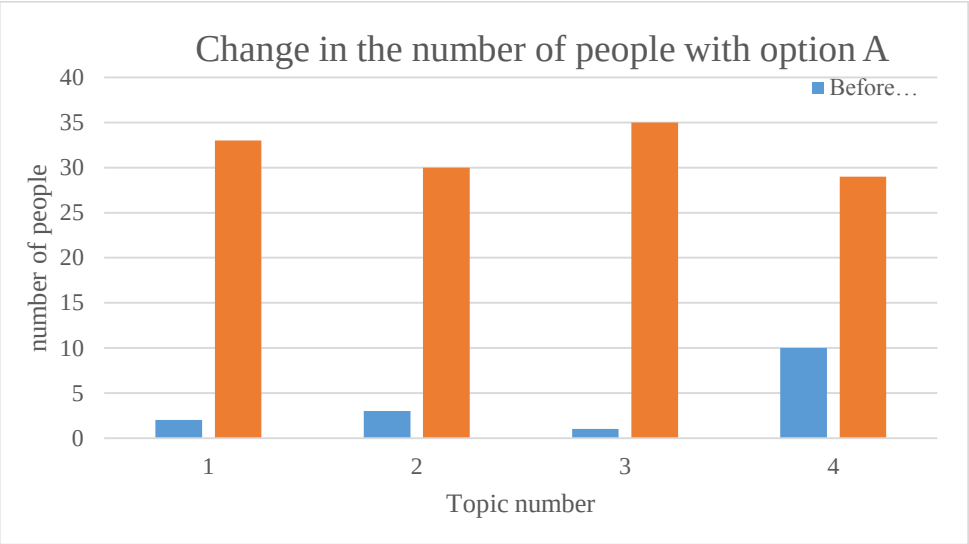

Figure 6. The number of people who responded to option A before and after the experimental class

After analysis, the interactive teaching method has been recognized by most of the students, and can stimulate students' interest in learning and improve their calligraphy level.

4.2. Empirical Evidence of Evaluation Scales

After the interactive calligraphy classroom teaching evaluation scale was developed, this paper investigated the calligraphy classroom teaching situation in two primary schools (School A and School B), in order to verify the validity and feasibility of the scale. 40 calligraphy lessons in these two primary schools were investigated in a random manner. School A was an interactive calligraphy virtual teaching class based on educational psychology, and School B was a traditional calligraphy class. The inspection results are as follows:

Among the 40 calligraphy classes in School A, 14 classes were rated as excellent, 16 classes were rated as good, 8 classes were rated as passing, and 2 classes were rated as failing. Among the 40 calligraphy classes in School B, the teaching evaluation of 10 classes was excellent, the teaching evaluation of 14 classes was good, the teaching evaluation of 12 classes was passing, and the teaching evaluation of 4 classes was failing, as shown in Figure 7.

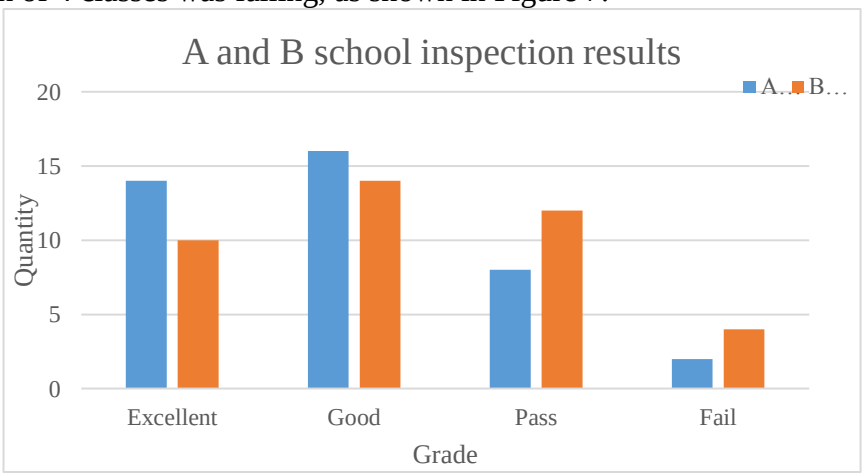

Figure 7. Overall evaluation of calligraphy classes in schools A and B

In the collected 40 calligraphy classroom evaluation scales in schools A and B, in the teaching activity goal with a full score of 10 points, the average score of the classroom of School A was 7.5 points, and the average score of the classroom of School B was 7.3 points. In the process of teaching activities with a full score of 50 points, the average score of the classroom of School A was 36.4 points, and the average score of the classroom of School B was 30.2 points. In the teaching effect with a full score of 30 points, the average score of the classroom of School A was 21.6 points, and the average score of the classroom of School B was 19.3 points. In the quality of teachers out of 10 points, the average score of the classroom in School A was 9.2 points, and the average score of the classroom in School B was 8.9 points, as shown in Figure 8.

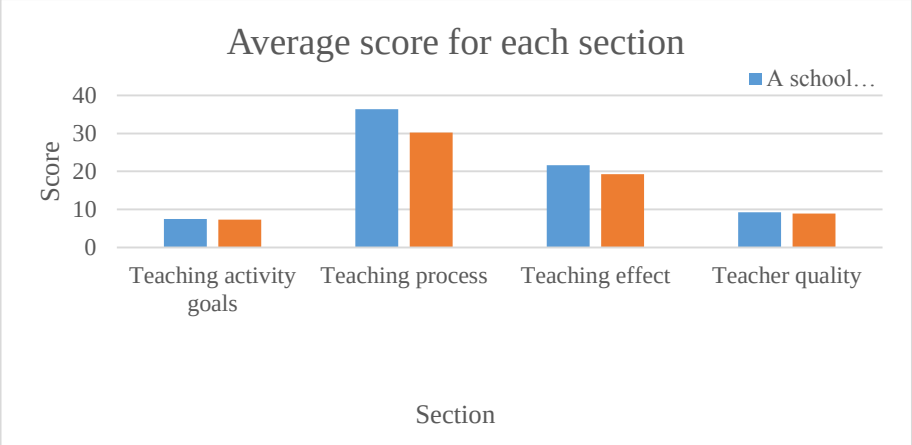

Figure 8. Average scores on the evaluation scale for each teaching part of schools A and B

4.3. Empirical Summary of Evaluation Scales

Based on the investigation of the calligraphy classes in schools A and B, this paper found that there were only 2 classes in the calligraphy class of School A, which were relatively poor in the implementation of classroom teaching, and the overall level of classroom teaching was still relatively good. From the overall observation results, it can be seen that the score of School B was lower than that of School A in all aspects, especially in the process of teaching activities, the average score of class A was 6.4 points higher than that of class B. It can be seen that the interactive calligraphy virtual teaching based on educational psychology had certain advantages in practical application. In the calligraphy classroom teaching, the results in the aspects of teaching activity goal, teaching activity process, teaching effect and teacher quality were relatively ideal. However, the average scores of the two teaching modes A and B were not excellent, indicating that there was still a lot of room for improvement, and the good teaching purposes and teaching effects in many aspects had not achieved.

5. Conclusion

Due to the rapid development of network technology, virtual teaching has also developed rapidly. Virtual teaching can be said to be a new and efficient teaching product in the new era, which can effectively assist or even replace classroom teaching. With the support of computer technology, virtual teaching relies on the interactive interface of the computer to convey the teaching content in the form of video and audio signals, so as to achieve the goal of teaching. It allows students to truly master relevant knowledge, and to a certain extent can be more effective than the traditional teaching mode, so research in this area is particularly important to the development of the education industry. This paper conducted research on this basis, and sorted out a relatively reasonable and

scientific interactive calligraphy virtual teaching evaluation scale based on educational psychology. This teaching evaluation scale as empirically analyzed and tested in teaching practice. The results showed that the research in this direction had great practical significance for the teaching model, and it is worth continuing to study in depth.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Chang L, Jie X, Ju W, Chen X, Fang D. RF-Copybook: A Millimeter Level Calligraphy Copybook based on commodity RFID. Proceedings of the ACM on Interactive Mobile Wearable and Ubiquitous Technologies. (2018) 1(4): 1-19. https://doi.org/10.1145/3161191

[2] Fei C, Huang Y, Xin Z, Shang C, Yang L, Zhou C, et al. A robot calligraphy system: From simple to complex writing by human gestures. Engineering Applications of Artificial Intelligence. (2017) 59(mar.): 1-14. https://doi.org/10.1016/j.engappai.2016.12.006

[3] Loup-Escande E, Frenoy R, Poplimont G, Thouvenin I, Gapenne O, Megalakaki O. Contributions of mixed reality in a calligraphy learning task: Effects of supplementary visual feedback and expertise on cognitive load, user experience and gestural performance. Computers in Human Behavior. (2017) 75(oct.): 42-49. https://doi.org/10.1016/j.chb.2017.05.006

[4] Mayne R, Green H. Virtual Reality for Teaching and Learning in Crime Scene Investigation. Science & Justice. (2020) 60(5): 466-472. https://doi.org/10.1016/j.scijus.2020.07.006

[5] Fuping Xie, Huanhuan Liu, Jiamin Chen, et al. Evaluation of using Proplan virtual software in teaching of orthognathic surgery. Journal of stomatology. (2018) 27(4): 436-439.

[6] Carlos A, Garcia Gustavo, Caiza Jose. An Approach of Training Virtual Environment for Teaching Electro-Pneumatic Systems - ScienceDirect. IFAC-PapersOnLine. (2019) 52(9): 278-284. https://doi.org/10.1016/j.ifacol.2019.08.221

[7] Bailey J H, Rutledge B. The Educational Psychology of Clinical Training. American Journal of the Medical Sciences. (2017) 353(2): 96-100. https://doi.org/10.1016/j.amjms.2016.10.011

[8] Ibrahim Mona, Agbenin Itohan. The Impact of Flipping an Educational Psychology Classroom on Learning at Different Levels of Bloom's Taxonomy. Perspectives in Learning. (2018) 17(1): 4-4.

[9] Boyle Christopher. Progressive Educational and Developmental Psychology. Australian Educational and Developmental Psychologist. (2017) 34(01): i-ii. https://doi.org/10.1017/edp.2017.7

[10] Grimmelikhuijsen S, Jilke S, Olsen A L, Tummers L. Behavioral Public Administration: Combining Insights from Public Administration and Psychology. Public Administration Review. (2017) 77(1): 45-56. https://doi.org/10.1111/puar.12609

[11] Chang L, Xiong J, Wang J, Chen X, Wang Y, Tang Z, et al. RF-Copybook. Proceedings of the Acm on Interactive Mobile Wearable & Ubiquitous Technologies. (2018) 1(4): 1-19. https://doi.org/10.1145/3161191

[12] Sonja Arntzen. Sugawara and the Secrets of Calligraphy. Edited and translated. Journal of the Royal Asiatic Society of Great Britain & Ireland. (2017) 27(Jul. Pt.3): 534-536. https://doi.org/10.1017/S1356186317000086

[13] Tang J B. Virtual teaching activities and wide-awake hand surgery in 2020 in China. Journal of Hand Surgery (European Volume). (2021) 46(2): 219-221. https://doi.org/10.1177/1753193420983991

[14] As A, Mm B, Hh B, Pr B. COVID-19 lockdown learning: The uprising of virtual teaching. Journal of Plastic, Reconstructive & Aesthetic Surgery. (2020) 73(8): 1575-1592. https://doi.org/10.1016/j.bjps.2020.05.032

[15] Xinghua Liu. Writing Instruction, Writing Research, and Educational Psychology: an Interview with Steve Graham. Educational Psychology Review. (2017) 29(1): 175-187. https://doi.org/10.1007/s10648-016-9375-1

[16] Hiroshi Hojo. Psychophysical scaling of smiling faces. Japanese Psychological Research. (2017) 29(1): 37-41. https://doi.org/10.4992/psycholres1954.29.37

[17] Shen Y, Guo D, Weng L, Wang S, Cai Z. Tumor-derived exosomes educate dendritic cells to promote tumor metastasis via HSP72/HSP105-TLR2/TLR4 pathway. OncoImmunology. (2017) 6(12): 00-00. https://doi.org/10.1080/2162402X.2017.1362527

[18] Mcnamara K H. Research Article: Fostering Sustainability in Higher Education: A Mixed-Methods Study of Transformative Leadership and Change Strategies. Environmental Practice. (2017) 12(1): 48-58. https://doi.org/10.1017/S1466046609990445

[19] Kaufmann E, Sanz J, Dunn J L, Nargis Khan, Mendona, Laura E, et al. BCG Educates Hematopoietic Stem Cells to Generate Protective Innate Immunity against Tuberculosis. Cell. (2018) 172(1-2): 176-190. https://doi.org/10.1016/j.cell.2017.12.031

[20] Harapan H, Anwar S, Bustamam A, Radiansyah A, Angraini P, Fasli R, et al. Willingness to pay for a dengue vaccine and its associated determinants in Indonesia: A community-based, cross-sectional survey in Aceh. Acta Tropica. (2017) 166(Complete): 249-256. https://doi.org/10.1016/j.actatropica.2016.11.035

[21] Wei M, Yang T, Chen X, Wu Y, Wang Z. Malignant ascites-derived exosomes promote proliferation and induce carcinoma-associated fibroblasts transition in peritoneal mesothelial cells. Oncotarget. (2017) 8(26): 42262-42271. https://doi.org/10.18632/oncotarget.15040

[22] Dai Y, Xia H, Yu Z, Tian Y, Li M, Xu X. Elevated lead levels and changes in blood morphology and erythrocyte CR1 in preschool children from an e-waste area. Science of the Total Environment. (2017) 592(AUG.15): 51-59. https://doi.org/10.1016/j.scitotenv.2017.03.080