Research on Online Digital Painting Creation Education Model Based on Cloud Platform

Rong Yu(✉)

College of Art and Design, Nanning University, Nanning 530200, China
rongyu56987@126.com

Abstract. In order to improve the ability of online digital painting creation and ensure the effect of online digital painting creation education, an online digital painting creation education model based on cloud platform is proposed. Build an online digital painting creation education management platform, design online digital painting creation management indicators and evaluation algorithms, and realize online digital painting creation education. The experimental results show that the online digital painting creation education model based on cloud platform has high practicability and effectiveness in the process of practical application. It can effectively improve the online digital painting creation ability, ensure the effect of online digital painting creation education, and fully meet the research requirements.

Keywords: Cloud platform · Online teaching · Digital painting · Creative education model

1 Introduction

The informatization of digital painting creation education and the globalization of education have established the educational concept of "opening and sharing" in the field of world education. Emerging information technology includes big data, cloud technology and artificial intelligence. As the fourth type of emerging information technology, cloud platform technology has the advantages of the first three types of information technology. "Cloud platform education" brings new inspiration to the teaching method of digital painting creation [1]. The traditional information-based digital painting creation education mostly stays at the level of means and methods, and does not realize the major structural change of the education system supported by information technology. The main body and core of the education system is "school education", and the main place for the implementation of school education is "classroom teaching".

The most important "structural change" in the school education system is to realize the change in "classroom teaching structure". Therefore, the key to changing the classroom teaching structure of traditional digital painting creation lies in the deep integration of emerging information technology and subject teaching. Build an online teaching mode through the background of "cloud platform education" to provide an appropriate platform and guarantee for the realization of digital painting creation classroom teaching

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[2]. Educational informatization and educational globalization have established the educational concept of "opening and sharing" in the field of world education. Changing the traditional classroom teaching structure of digital painting creation is the key to the deep integration of new information technology and subject teaching. Build an online teaching mode through the "cloud platform" educational background to provide a suitable platform and guarantee for the realization of digital painting creation classroom teaching [3].

In order to solve the above problems, research on online digital painting creation education model based on cloud platform is proposed. First, it should be combined with modern science and technology to optimize the interactive management mode of online digital painting creation education, make use of the communication advantages of mobile Internet, build online and offline teaching methods, mobilize students' enthusiasm and improve the effectiveness of the model through group division of labor. Secondly, adopt flexible propaganda forms to improve students' practical ability, stimulate students' creative desire, make students have a strong willingness to learn, and enhance the practicality of the model. Finally, establish a code of conduct in an interactive environment to ensure the effect of online digital painting creation education.

2 Online Digital Painting Creation Education Model

2.1 Online Digital Painting Creation Education Management Platform

With the rise of information-based teaching, most schools have begun to introduce electronic interactive whiteboards. The cloud platform combines the teaching content with modern science and technology, and leads students to feel the charm of new media technology without eliminating the blackboard. As a new media technology, the cloud platform enters the digital painting creation classroom, which means that China's education has reached a new stage of development and that the new media interactive teaching conforms to the development of the times [4]. Based on this, the interactive management mode of online digital painting creation education is optimized in combination with

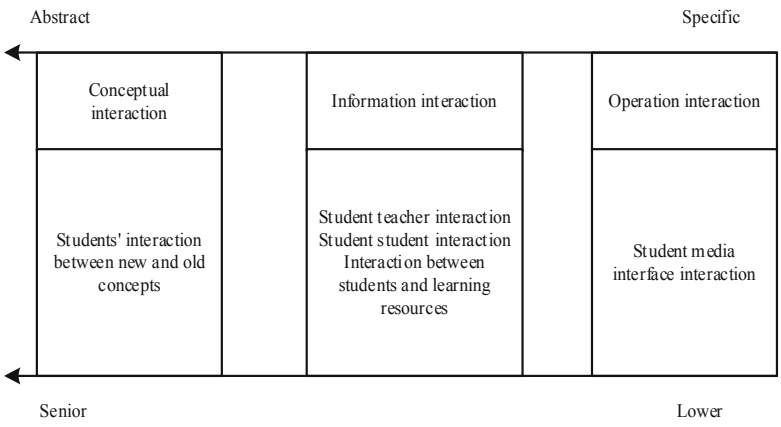

Fig. 1. Interactive management mode of online digital painting creation education

cloud platform technology. The interactive management mode of online digital painting creation education is shown in Fig. 1.

Cloud platform teaching emphasizes people-oriented, and teachers and students communicate with each other through two-way or multi-directional communication, so as to realize mutual communication and promotion. In the teaching process, cloud platform teaching regulates the relationship between educators, learners and network platform, realizes three aspects of communication and cooperation, and improves teaching efficiency. Cloud platform teaching has changed the traditional teacher centered teaching method into a teacher's monologue and the joint participation of teachers and students [5]. Students are no longer passive learners, but active learners. Based on the traditional interaction between teachers, students and students, a diversified interactive teaching model supported by new media technology is also derived, that is, the interaction between teachers, students and teaching media. The digital painting creation curriculum standard points out that teachers need to flexibly use the network and new media to carry out digital painting creation teaching, use network resources to enrich digital painting creation classroom resources and broaden students' thinking. Encourage students to take the initiative to collect and sort out materials and use computers or digital cameras for creation [6]. As the digital painting creation course is practical, it guides students to use new media or traditional media in creation to develop imagination and creativity. Through the digital painting creation course, the school can cultivate students' diversified aesthetic concepts and humanistic quality, so as to realize aesthetic education. The digital painting creation course emphasizes the visual and humanistic nature [7]. The basic concept of the digital painting creation curriculum standard is to mobilize the interest in learning digital painting creation, pay attention to culture and life, cultivate innovative awareness and practical ability, and lay the foundation for lifelong learning. Based on this background, the interactive teaching mode of art under the background

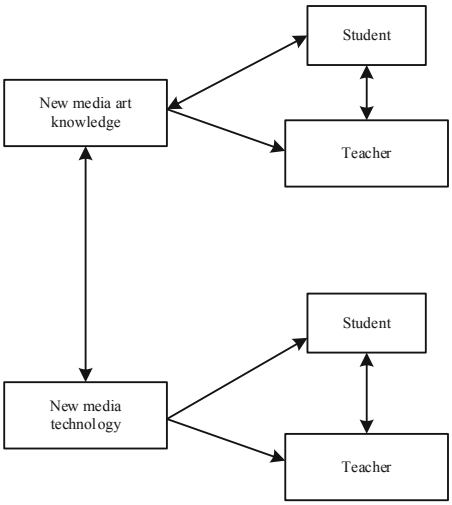

Fig. 2. Art interactive teaching under the background of new media

of new media is innovated. The interactive teaching of art under the background of new media is shown in Fig. 2.

The teaching of digital painting creation is one of the effective ways to improve the level of students' artistic accomplishment, and the appreciation ability of digital painting creation is the driving force for the development of aesthetic activities. The design of teachers and students in the current digital painting creation classroom needs to be strengthened. Due to the influence of exam-oriented education, most students choose to work alone and complete their learning tasks independently. Even in group cooperation, the learning task finally falls on the students with good academic performance. Referring to the teaching model design of predecessors, combined with the subject characteristics of digital painting creation education in colleges and universities, and making full use of the dissemination advantages of mobile Internet, the online and offline teaching of digital painting creation education courses in colleges and universities is constructed. The design of online and offline teaching mode based on cloud platform includes six steps: teaching analysis, teaching content, teaching strategy, teaching media, teaching process and teaching evaluation. Based on this, the "online + offline" hybrid teaching mode is innovated, as shown in Fig. 3.

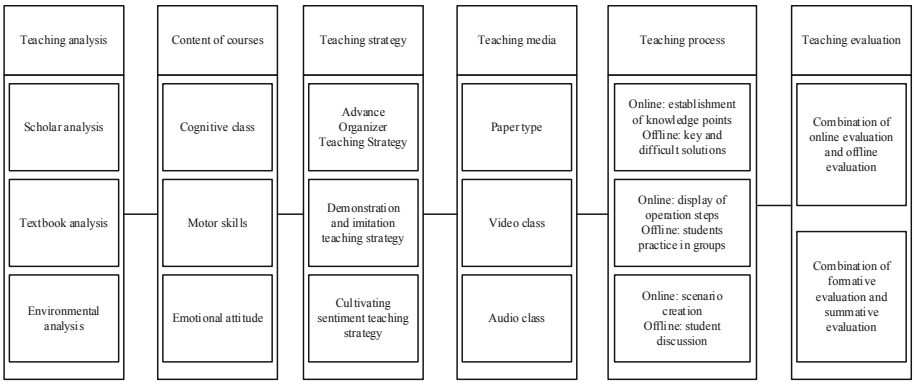

Fig. 3. Hybrid teaching mode of "online + offline"

In the process of teaching, most students only express their views or say nothing in group discussion. The whole group discussion has a weak sense of cooperation and low learning efficiency. Through group cooperation, you can create interesting works and let students feel the fun of cooperation. Teachers of digital painting creation should reasonably organize the classroom teaching content and correctly guide the teaching process. Timely evaluation and correction, and use positive emotions to drive the whole class. Capture and screen all kinds of effective information in real time, grasp students' psychology and classroom rhythm, and achieve better teaching effect. Stop chatting and other behaviors that deviate from the teaching objectives, and carry out differentiated education for different students. Cloud platform teaching in the context of new media can cultivate each student to learn actively and master various qualities and abilities needed in the future. Group division of labor, establish friendship and cultivate students'

unity and cooperation ability. With the active participation of each student, there will be no endless painting practice and inefficient classroom.

2.2 Evaluation Algorithm of Online Digital Painting Creation Education

With the continuous development of cloud platform online teaching, students' personal hands-on ability has played a vital role in cultivating students' artistic sentiment and improving the comprehensive appreciation ability of digital painting creation. The appreciation of digital painting creation can reflect the individual's unique views on artistic works, so it has strong personal subjectivity. From a comprehensive point of view, adopting flexible propaganda forms and not taking personal arbitrary consciousness as public thought are effective ways to improve students' practical ability. On the premise that students' practical ability has been effectively improved, encouraging students to feel the artistic charm of digital painting works in their own way is an effective way to improve the appreciation ability of digital painting creation. There are four main objects of teaching evaluation, one is curriculum products or curriculum materials, the other is students' academic achievement, which is the curriculum and teaching process, and the fourth is teachers' curriculum and teaching performance. They are all composed of basic elements such as evaluation subject, object, method and standard. The evaluation object discussed in this paper focuses on the evaluation of students' academic achievement, and takes the "result" of students' learning as the evaluation carrier. Generally speaking, students' academic achievement evaluation includes the evaluation of usual academic achievement and final academic achievement. The fields of evaluation include cognitive field, motor skill field and emotional field. It usually focuses on the cognitive field, including six categories: practice, understanding, application, analysis, synthesis and evaluation. The formulation of these evaluation objectives is to better complete the teaching objectives and achieve the teaching standards. The relationship between art homework requirements and teaching evaluation is shown in Table 1.

Teachers often evaluate the creativity, expressiveness and imagination of students' works by whether their digital paintings meet the requirements of homework. When the user achieves the sub-goal, there will be a mapping relationship between the real behavior and the virtual behavior. If the relatively stable mapping relationship is defined as the behavior habit $f(x)$, the unstable mapping relationship can be defined as the behavior habit $f(x)$ in the process of evolution. In this way, a behavioral habit in the process of evolution can be regarded as a composite of several behavioral habits:

$$f'(x) = \begin{cases} \lambda_1 f_1(x) + \lambda_2 f_2(x) + \lambda_3 f_3(x) + \ldots + \lambda_n f_n(x) \\ \lambda_1 + \lambda_2 + \lambda_3 + \ldots + \lambda_n = 1 \end{cases} \tag{1}$$

In formula (1), the coefficient λ_n is the weight of the behavior habit in the process of evolution, which can be called the evolution coefficient; when only one coefficient is not 0, it is a relatively stable static behavior habit. The three most distinctive features in painting are: the image outline information is obvious; the image texture features are clear; the image color layering and the contrast between light and dark are distinct. The above three characteristics are satisfied to be a qualified digital painting, so the intelligent image processing technology is mainly designed for these three points. The application process of the cloud platform digital painting processing technology is shown in Fig. 4.

Table 1. Relationship between art homework requirements and teaching evaluation

Operation requirements and instructions	Examples of job requirements and weights	Teaching evaluation	
Basic requirements (what to do)	Draw a group of still life by line drawing; For example: line 30%	Knowledge and skills objectives	Standards of compliance and passing
Concretization (to what extent)	Draw the structure and details of still life; Pay attention to the insertion and density of lines	Achievement goals	Passing standards
Optional part (what else can I do)	Choose your favorite still life and write why; You can choose your favorite tools and wires	Process and method, emotional attitude and value goal	Autonomous learning style

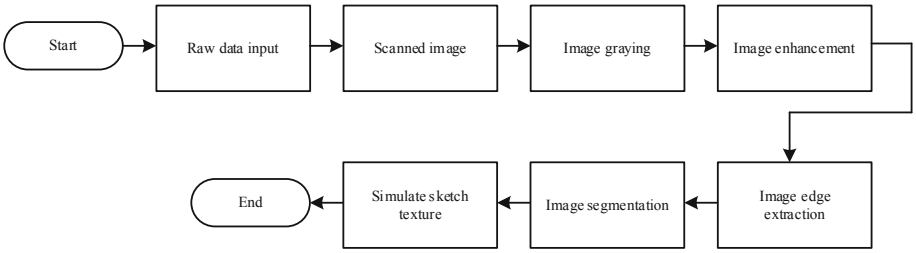

Fig. 4. Application in automatic generation of digital painting technology

As can be seen from Fig. 4, the application of image processing technology in the automatic generation of digital painting is mainly divided into the following steps: first, input the original portrait into the computer, then automatically scan it, then carry out portrait graying, portrait enhancement, portrait edge extraction, portrait segmentation, etc., and finally simulate the sketch texture to generate a digital painting. After the portrait edge extraction, it enters the segmentation link. Segmentation refers to the process of subdividing an image into multiple image sub regions. At present, the commonly used segmentation methods are based on threshold, region, edge and specific theory. The segmentation method based on image edge is adopted. The specific process is as follows: firstly, the extracted portrait is binarized, that is, the gray value of all pixels on the image is set to 0 or 255, so as to separate the target person from the background in the image. It is expressed by mathematical formula as follows:

$$f'(x,y) = \begin{cases} 0 \; f(x,y) \geq R \\ 255 \; f(x,y) < R \end{cases} \tag{2}$$

In formula (2), $f'(x,y)$ is the binarized portrait; $f(x,y)$ is the mathematical expression of the image; R is a value in the grayscale range $[e, e']$. The most important point of

image binarization is to determine an appropriate threshold R. If the value of R is set too high, it may cause the target object in the image to be recognized incorrectly. If the value of R is set too low, it will be completely unrecognized. The most commonly used methods for R value determination are as follows: bimodal method, parameter method, high probability method, maximum entropy threshold method, iterative method, etc. The bimodal method is chosen here to determine the threshold R. Extracting the evolution coefficient of each research object user in completing a certain sub-goal to construct a matrix, which is the habit pattern matrix of the goal. The user group habit pattern matrix constructed according to the n behavior habits of the target user group composed of this i user when completing a sub-goal:

$$\lambda = \begin{pmatrix} \lambda_{11} & \lambda_{12} & \cdots & \lambda_{1n} \\ \lambda_{21} & \lambda_{22} & \cdots & \lambda_{2n} \\ \vdots & \vdots & & \vdots \\ \lambda_{i1} & \lambda_{i2} & \cdots & \lambda_{in} \end{pmatrix} \tag{3}$$

Digital painting creation assignments require more training standards for students' digital painting creation knowledge and skills, processes and methods. This directly leads to the evaluation of students' digital painting creation works (homework), and also reviews from the aspects of digital painting creation knowledge and skill goals. The desire to create is the main manifestation of the appreciation ability of digital painting creation. Under the condition that the teaching standards of digital painting creation continue to be maintained at a high level, it is an effective way to promote the continuous improvement of the appreciation ability of digital painting creation by using feasible means to stimulate students' creative desire and make students have a strong willingness to learn digital painting creation. Digital painting works are not only the epitome of various social phenomena, but also the subjective expression of the material and spiritual life of human society. For students, opening the door to the cognitive world through digital painting creation can not only effectively improve their artistic literacy, but also maximize the impact of cloud platform online teaching on the premise of maintaining a high level of digital painting creation appreciation ability. The basic elements and corresponding artistic value of cloud platform online teaching are shown in Table 2.

In the process of comment, students' digital painting creation homework has undoubtedly become the evaluation object, waiting for teachers to correct and grade it. The aesthetic ability shown in homework and the relationship between life and works have not been well valued by digital painting teachers.

2.3 Realization of Digital Painting Creation Education

Establish the description specification of real behavior and virtual behavior. In this interactive environment, there are few kinds of description of real behavior because the input devices are limited to stylus, mouse, keyboard and digital board. The observation of virtual behavior can be reflected in the description of a large number of function calls and function use. Therefore, when recording the mapping relationship between

Table 2. Summary of basic elements of cloud platform online teaching

Cloud platform online teaching elements	Basic artistic value
Artistic image	Different artistic images correspond to different artistic information, which is the basic standard for shaping the creative appreciation ability of digital painting
Form of composition	The composition of art works directly reflects the utilization value of digital painting creation resources
Color organization	Color matching reflects the appreciation value of digital painting works
Emotional expression	Emotional expression is an effective way to express the appreciation value of digital painting

real behavior and virtual behavior, the records are classified according to the occurrence of real behavior. When the fuzzy mapping relationship is found in the observation, pay attention to mark the approximate proportion of various relationships in the behavior mapping. The mapping relationship is recorded for each research object to provide a data source for the establishment of habit form model. In the mapping relation record of a research object, the gray circle shows the fuzzy mapping relation, and the brackets show the mapping proportion calculated based on the occurrence frequency. The mapping record of digital painting creation teaching behavior is shown in Fig. 5.

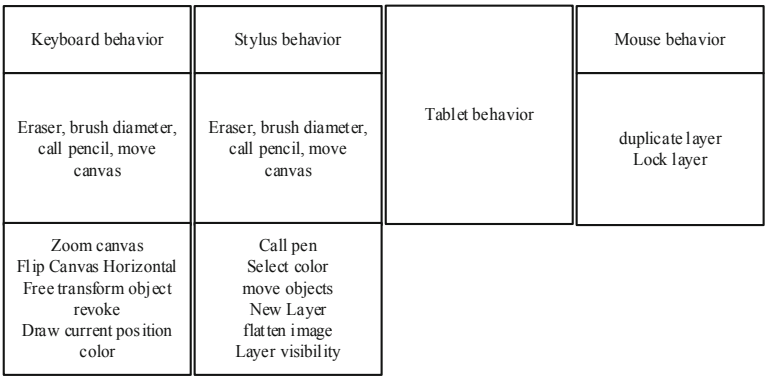

Fig. 5. Mapping record of digital painting creation teaching behavior

Due to the inconsistency of personal painting style, the requirements for system functions in the painting process are also different. Various painting styles are processed through the personal style of famous painters, and under the influence of strong network communication, they produce complex integration and intersection, which is difficult to be clearly defined. Therefore, in this study, the task sequence method is not used to define the functional requirements, but the sub target behavior set established by the previous

observation is directly used as the basic unit to define the system function list through frequency analysis and common work stage inspection. Function usage frequency refers to the number of people who have called the function in the research object set. The usage frequency of each function is calculated, as shown in Table 3.

Table 3. Frequency of function use (number of samples: 50)

	Number	Function name	Frequency		Number	Function name	Frequency
First interval	A1	Maximum diameter	50	Third interval	C1	Call paint bucket	29
	A2	Zoom out zoom in on canvas	50		C2	Flip Canvas Horizontal	28
	A3	Select color	50		C3	Merge Down	28
	A4	New Layer	50		C4	Call Lasso Tool	27
	A5	Select layer	50		C5	Call the select Pen tool	25
	A6	Move canvas	50		C6	Select free transform mode	24
	A7	Call rubber	48		C7	Call the selection tool to select	24
	A8	Revoke constituency	47		C8	Cut layer mask	23
Second interval	B1	Adjust layer transparency	44	Fourth interval	D1	Minimum diameter	18
	B2	Call pencil	40		D2	Brush density	18
	B3	Toggle layer visibility	38		D3	Rotate canvas	18
	B4	Free transform object	37		D4	Call watercolor pen	17
	B5	Mixed mode	36		D5	Protect opacity	17

(*continued*)

Table 3. (*continued*)

	Number	Function name	Frequency		Number	Function name	Frequency
	B6	Draw current position color	33		D6	Call blur tool	16
	B7	Call pen	32		D7	Call custom brush	15
	B8	Call magic wand tool	32		-	-	-

In order to easily discuss and describe the data object, we divide the whole behavior set into five intervals by numbering the function call behavior, combining the graphic distribution and interview data analysis. The common stages of user painting can be summarized as two stages: establishing working environment, draft operation, line draft operation (unnecessary color operation), adjustment operation (unnecessary), storage operation, establishing working environment and storage operation. It is not the key function of the digital painting system. The list of functional requirements of the new system after removing these two parts, and the general functions existing in each stage are only displayed in the column of the previous stage, which is not repeated in the column of the latter stage. The list of system functional requirements is shown in Table 4.

Table 4. List of system functional requirements

Draft assignment	Frequency	Line draft operation	Frequency
Maximum tool diameter	50	Select layer	50
Zoom out zoom in on canvas	50	Adjust layer transparency	41
New Layer	49	Mixed mode	38
Move canvas	49	Flip Canvas Horizontal	27
Revoke	48	____	____
Call rubber	47	____	____
Call pencil	42	____	____
Call pen	38	____	____

Digital painting studio is a place for professional teachers to carry out scientific research and project creation. At the same time, it is also a learning base for practical

training and teaching for students. The area of digital painting studio is unlimited, and its scale is mainly determined by the specific creative needs. The software and hardware facilities to be prepared are as follows: more than 20 sets of computers, digital boards and pressure sensitive pens are configured, and the specific number of these hardware equipment is also determined by the creative needs. Install professional digital painting software Painter, graphics processing software Photoshop, etc. High power scanner table, used for the input of illustration line draft. Color printer or inkjet machine, used for digital painting output.

3 Experiment

3.1 Experimental Analysis

The design of the online digital painting creation education model is realized under the VC++ platform. It gets rid of the traditional Windows interface style and uses a vivid and beautiful interface to make the operation simpler and more sensitive. When designing this page, we integrate the design concept of visual communication, abide by the design principles, and design the text, pictures and cover in the interface. The design scheme adds posture interaction in the fine workflow. In order to evaluate the impact of this strategy on the level of system availability and ease of use, and clarify whether the research method can achieve the expected effect in solving experience problems, the research group carried out pre-test experiments on the above interactive prototype. The host of the experiment first introduced the content of the experiment through a simple conversation and understood the basic information of the participants, so as to ease the tension of the participants and ensure the smooth progress of the experience. In order to ensure the experimental effect and standardize the experimental environment and parameters, five students were selected to paint on the online digital education model using windows10 system and Apache server, the list of subjects is shown in Table 5.

Table 5. List of subjects

User number	Gender	Fundamentals of painting	Digital painting experience	Habitual holding posture of watercolor brush
1	Female	Have	Have	Hold the middle
2	Female	Have	Nothing	Hold tail
3	Male	Have	Nothing	Hold the middle
4	Female	Have	Have	Hold tail
5	Male	Have	Nothing	Hold tail

Further, on the premise of keeping the teaching level of digital painting creation and the emotional experience level of digital painting creation unchanged, determine the changeing trend of digital painting creation appreciation when the students' practical ability level remains improved, stable and declining.

3.2 Experimental Results

In order to further verify the effectiveness of the paper method, the indicator level is taken as the evaluation index. The higher the indicator level is, the better the effect of online teaching is, which affects the creative ability of digital painting. The impact of online teaching on the creative ability of digital painting is shown in Fig. 6.

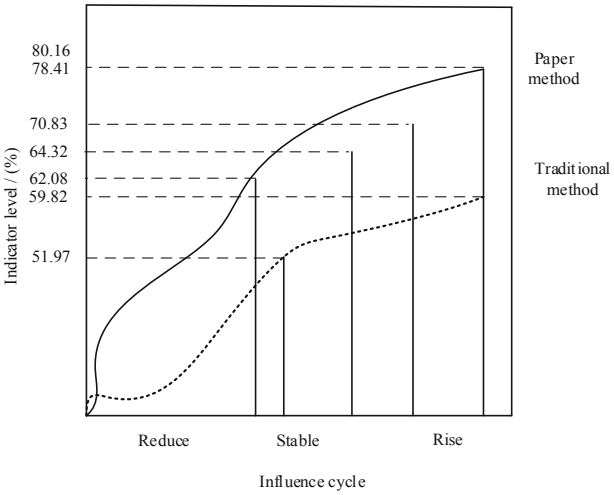

Fig. 6. Influence of online teaching on digital painting creation ability

According to the analysis of Fig. 6, under the influence of cloud platform online teaching, students' digital painting ability has been greatly improved compared with traditional methods, which fully meets the research requirements.

4 Conclusion

Teaching design always runs through the whole process of digital painting creation teaching activities, in order to improve the ability of online digital painting creation, an online digital painting creation education model based on cloud platform is proposed. Through the spread of mobile Internet, establish online and offline teaching mode to improve the effectiveness of the model; Adopt flexible propaganda forms, cultivate students' thinking ability, stimulate students' learning enthusiasm, and enhance the practicality of the model; Finally, the real behavior and virtual behavior are standardized in the interactive environment to ensure the educational effect of online digital painting creation.

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