Research on the Construction and Application of a Blended Learning Model Based on Junior High School Information Technology Skills Curriculum

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***Abstract*—In the trend of information technology in China, the combination of education and information technology has become an inevitable trend. In order to further promote education and teaching reform, improve teacher teaching quality, and promote student learning effectiveness, a new blended teaching model based on junior high school information technology skills courses has been proposed and applied research has been conducted. This teaching model is prepared for skills courses in information technology, mainly adopting the design concept of "three stages and six steps", fully leveraging the advantages of mixed online and offline teaching models. At the same time, based on questionnaire surveys and mathematical statistics, the effectiveness of the new teaching model is verified from the perspectives of teaching effect satisfaction and student creativity level results. Research has shown that the application of this teaching model plays a positive role in promoting students' mastery of knowledge and skills, increasing their interest in learning, meeting the personalized learning needs of students at different levels, and cultivating their teamwork spirit.**

***Keywords*—blended learning, teaching mode, junior high school information technology, teaching practice**

I. Problem Posing

Nowadays, with the rapid development of information technology, the integration of education and information technology has become an inevitable trend in the development of information technology in China. The Chinese Ministry of Education has issued the "Education Informatization 2.0 Action Plan" [1] and other measures, we have opened up a new model of education governance in China under the conditions of informatization. At the same time, the recently released "New Curriculum Standards for Information Technology in Junior High School" in 2022 clarifies the basic concepts of the new curriculum, such as "improving students' information literacy, creating a good information environment, paying attention to all students, cultivating students' problem-solving abilities, and emphasizing communication and cooperation in information technology courses" [2]. Therefore, it is imperative to promote the reform of educational methods in the context of education and society.

In the traditional teaching mode, teachers unilaterally teach and demonstrate operations, while students practice. This teaching method has been applied in information technology classrooms for many years. Over time, problems have also increased, including:

- The teaching mode is single, students' interest is not high, and teaching efficiency is low.
- Students cannot flexibly process and apply information. Teachers lack the cultivation and stimulation of students' thinking abilities.
- Teachers overemphasize students' technical proficiency in learning computer operations while teaching, neglecting the design and innovation of teaching content.
- Due to significant differences in information literacy among students, the personalized learning needs of students in traditional classroom teaching have become increasingly vital [3].
- The evaluation method is relatively single, focusing on results and neglecting the process.

With the progress of information technology and the continuous development of information technology teaching, teaching methods have gradually increased in recent years. The teaching model based on "blended learning" provides greater flexibility for both students' learning and teachers' teaching, while also making the ways in which students acquire more diverse knowledge [4]. Compared with traditional educational methods, the teaching mode based on blended learning can achieve the effect of gathering advantages, timely feedback, emphasizing interaction, and flexible selection [5].

Based on an in-depth analysis of the demand for blended teaching in junior high school information technology skills courses, this study attempts to construct a blended teaching model. It applies it in practice, in order to effectively promote the full play of the advantages of blended teaching in these courses.

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II. Theoretical Framework

A. Blended Learning

Blended learning is an emerging term in education, but its concepts and ideas have a long history. According to Learning Circuits in the United States, Blended learning is a teaching model that organically integrates online teaching with face-to-face teaching [6]. There are different viewpoints in the academic community regarding the definition of blended learning. However, they all see Blended learning as a new learning method or a learning concept that can effectively integrate traditional teaching methods with online teaching methods, with the aim of making learning more straightforward, more convenient, and more in-depth, in order to achieve the best learning results.

Based on the content of this study, the precise definition of blended learning is as follows: Unlike E-Learning, blended learning is not simply a mechanical combination of traditional face-to-face teaching and online teaching methods, but can efficiently combine various elements and learning methods in the education process in an orderly manner [7]. In summary, blended learning consists of two parts: learning resources and learning methods. It should avoid relying solely on technology and be combined with the actual situation in our country. Based on inheriting the advantages of our traditional learning methods, it should be integrated with online learning environments and methods. The advantages of the two complement each other, to achieve breakthroughs in learning outcomes and ultimately achieve the desired state. A comprehensive analysis of specific teaching objectives, teaching conditions, and the actual situation of students is necessary in order to scientifically and reasonably apply blended learning methods and improve teaching effectiveness.

B. Junior High School Information Technology Curriculum

The newly released curriculum standards in 2022 indicate that "information technology" courses are more "information technology" courses. In the new curriculum standard, it is stated that its concepts [8] have the following points:

- Reflect on the correct orientation of cultivating talents in the digital era.
- Be based on students' understanding and development patterns during compulsory education, the overall planning of teaching content is carried out.
- Choose course content that emphasizes both theoretical foundations and practical applications.
- I am advocating authentic learning.
- Strengthen diversified evaluation guided by information literacy cultivation.

III. Blended Teaching Model Based on Junior High School Information Technology Skills Courses

A. Pattern Construction

The construction of this teaching mode is based on the following principles:

- Learner-centered: The concept of blended learning has developed rapidly, but it always emphasizes "people-oriented" [9]. Therefore, when constructing the model, this study emphasizes that teachers are guides and managers, placing students at the center of teaching activities, and emphasizing their subjectivity.
- Problem-solving oriented: When constructing patterns, the goal of teachers designing teaching processes is to solve the problems that students encounter in their daily lives [10]. Therefore, teachers should create a real problem scenario that can arouse students' interest in learning, guide students to define the problem and develop task plans through group cooperation, ultimately completing the task.
- Using iterative improvement as a means: The pattern construction of this study is a continuous iterative and dynamic process, which requires the author to continue teaching practice after preliminary construction, identify and improve problems, and continue to think about it to complete the final pattern construction [11].
- Using diversified evaluation as a means: Due to the vital process, iteration, and variability of pattern construction, the author should collect data from multiple perspectives and throughout the entire process of teaching and learning, and record the development of students at each stage, in order to maximize the continuity, systematicity, and comprehensiveness of the evaluation [12].

Based on the above principles, after three rounds of iterative practice of the action research method, a blended teaching model based on junior high school information technology skills courses is constructed, as shown in Fig. 1.

B. Pattern Analysis

This study is based on blended learning, combined with common task-driven teaching methods in information technology courses, and closely links online teaching applications with offline classrooms. For Operational skills courses in information technology, a blended teaching model based on junior high school information technology skills courses is constructed, and three primary teaching links, pre-class, in-class, and post-class [13] are established. At the same time, it fully implements the design concept of "three stages and six steps" in the teaching process. Among them, the "three stages and six steps" refer to the three stages in the class: the stage of defining the problem, the stage of conceptualizing the plan, and the stage of exploring and implementing the practice. The "six steps" are defined as identifying problems, learning and teaching skills, understanding and accepting tasks, conceptualizing solutions, collaborating to complete tasks, and presenting and evaluating works.

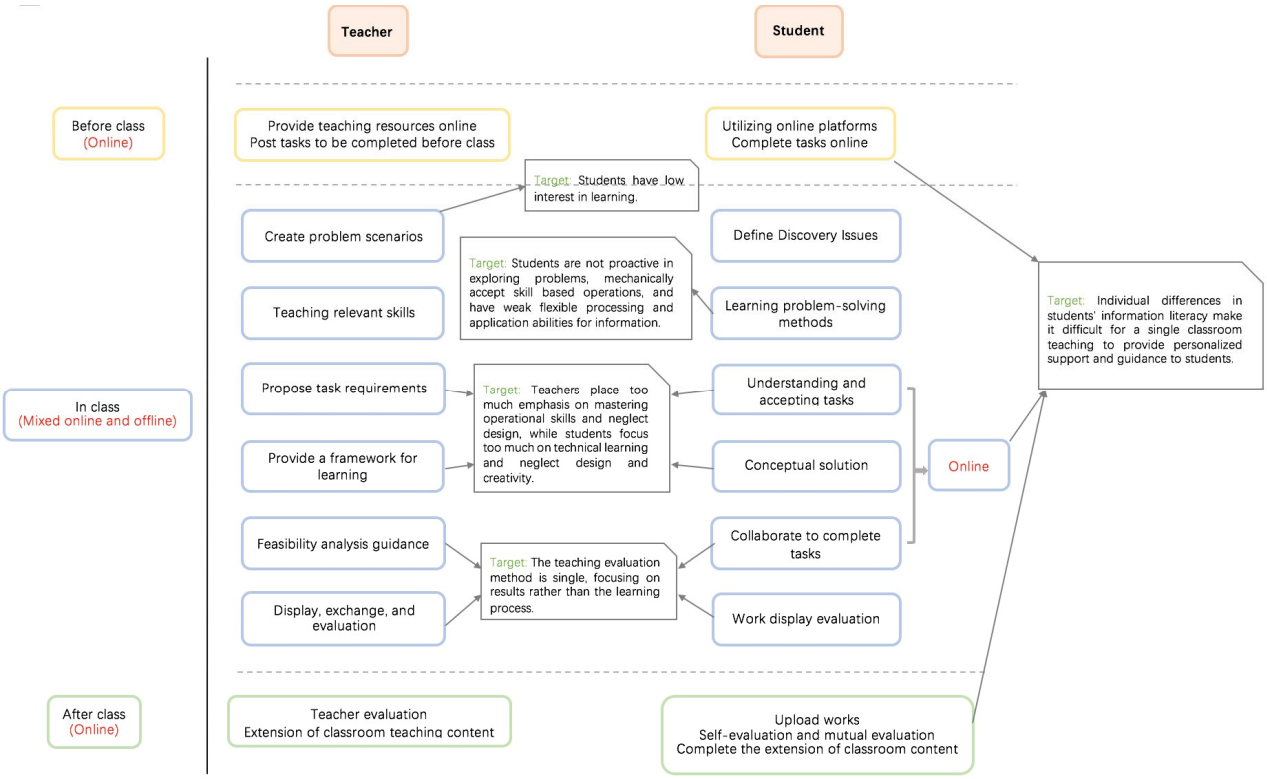

Fig. 1. Blended teaching model based on junior high school information technology skills courses.

- Pre-class: The teaching model constructed in this study provides students with rich course teaching resources before class, helping them establish a knowledge system. Therefore, teachers must design corresponding learning resources and use online platforms to send them to students. Students learn pre-class resources based on the task requirements released by the teacher and their situation, and provide feedback. Only by understanding the situation can teachers better serve students during the in-class stage.
- In-class:

(1) Problem definition stage: This stage is the process of discovering problems in the classroom; therefore, educators need to create a real-life context for learners to stimulate their learning enthusiasm. Learners complete the definition of the problem through understanding the problem context and guidance from the teacher, thus enabling the next teaching activity to proceed.

(2) Conceptual design stage: At this stage, learners need to develop solutions to problems, and educators need to provide learning scaffolds and guidance for learners. This section adopts the method of students' independent exploration and group cooperation. Students can express their different viewpoints from others, stimulate the collision of ideas between teams, utilize team collaboration, and refine division of labour.

(3) Practical exploration stage: This section completes practical operations and works display and exchange. After conducting a feasibility analysis of the plan, students begin the practical operation phase, inspect and revise the work, confirm the work, and report on their ideas and creativity in producing the work. In this process, the teacher only serves as a guide and helper.

- Post-class: Students upload their works to online platforms for sharing and learning, and teachers and other students can evaluate them. In the teaching model of information technology courses in junior high schools based on blended learning, evaluation should achieve diversification in terms of objects, processes, and indicators. Regarding the evaluation subject, it is mainly conducted through student self-evaluation, group mutual evaluation, and teacher evaluation. The evaluation process should be divided into procedural and summative evaluations. And, setting evaluation indicators from three aspects of knowledge, ability, and quality. Such a diversified evaluation system is beneficial for teachers to understand better whether cultivating students' abilities is effective.

However, it should be noted that teachers must be based on specific situations, such as the teaching objectives of the teaching content, and not unthinkingly apply the "three stages and six steps" concept. Instead, they should selectively set teaching activity steps suitable for the current curriculum, and continuously iterate through testing and improvement to ultimately complete the teaching activity design [14].

IV. Methodology

In order to further verify whether the teaching model has a good effect on the teaching practice of information

technology skills courses in junior high school, corresponding teaching practices need to be carried out. The author implemented teaching practice activities in the teaching class, and the experimental subjects were selected from a class in the first grade of junior high school. The research method used action research and combined with the constructed teaching model to carry out three rounds of iterative teaching practice, namely "Elementary Introduction to Graphical Programming" and "Inserting Graphic Images into PowerPoint".

In order to ensure the scientific accuracy of the research, the Williams Creativity Tendency Scale was conducted on the teaching class before and after the teaching practice (see the Effect Analysis section for the analysis of test results data).

After three rounds of action research, the author further analyzed the teaching effectiveness of teaching practice and the learning effectiveness of students. In order to test the various indicators of learners in the middle school information technology skills curriculum based on blended learning, the author analyzed the results from two aspects: satisfaction with teaching effectiveness and students' creativity level.

A. Survey and Analysis of Satisfaction with Teaching Effectiveness

In order to evaluate the teaching effectiveness of teaching practice from multiple aspects, the author mainly designed a questionnaire from three aspects: "students' satisfaction with the construction of blended teaching resources", "students' knowledge mastery and learning ability and attitude", and "students' satisfaction with blended teaching". The questionnaire was distributed to experimental class students through a questionnaire star after the teaching practice was completed, and 52 valid questionnaires were collected.

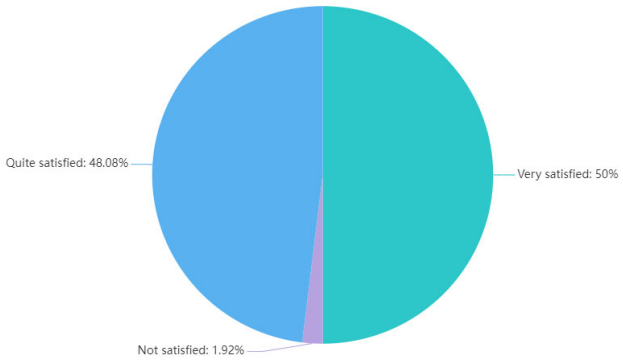

Fig. 2. Students satisfaction with the resource construction of hybrid teaching.

The statistical results of the data are shown in the figure below. The survey results show that (Fig. 2), the majority of students are satisfied with the construction of blended teaching resources, with 50% of students being very satisfied and 48.08% being relatively satisfied. From the questionnaire survey (Fig. 3), it can be seen that 52 people have completed the questionnaire. The online teaching resources that students feel are the most helpful to themselves are micro-courses and online electronic courseware, with their liking reaching 71.15% (37 people) and 65.38% (34 people), respectively. Students believe that micro-courses help them consolidate their knowledge or fill in gaps. In addition, the survey also showed that 50% (26 people) of students are very interested in knowledge expansion materials, which meets the requirements of some students with sound foundations who want to explore in depth.

Fig. 3. Statistics of students' favourite online teaching resources.

According to the survey (Fig. 4), 44.23% of students believe they are proficient and relatively proficient in basic computer knowledge and operations. Through classroom feedback, students have become proficient in fast typing. Some students can use Word software to organize learning notes and plans, while others can use Excel software to record and analyze their learning results. Additionally, students can use PowerPoint and Meitu to create electronic photo albums for their class activities. Some students even use video editing software to record and edit vlogs for class evenings, which reflects the combination of informatization and students' daily learning and life.

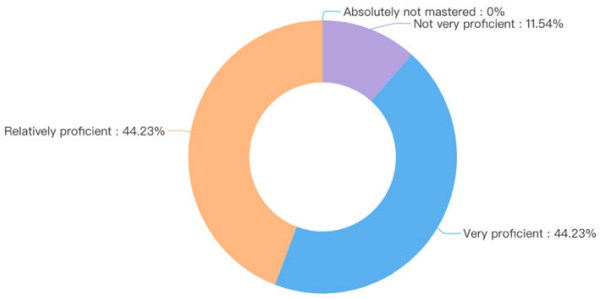

Fig. 4. Students' mastery of basic computer knowledge and operation.

In terms of evaluating learning ability, through a questionnaire survey (Fig. 5), a total of 80.77% of students believe that their autonomous learning ability has been improved after blended learning. The students unanimously expressed that the combination of teaching resources based on online platforms and face-to-face classes, as well as teaching methods based on flexible, interactive forms, has enhanced their learning enthusiasm and reduced the difficulty of autonomous learning. Nowadays, many students actively think and use search engines to find answers when facing problems. As shown

in Fig. 5b, 19.23% of people believe that their group collaboration ability has been significantly improved, while 61.54% believe that it has been improved to some extent. Students generally acknowledge the learning style of group collaboration, believing that helping each other in a team can better help them solve problems and progress together. They can also train their teamwork and communication skills.

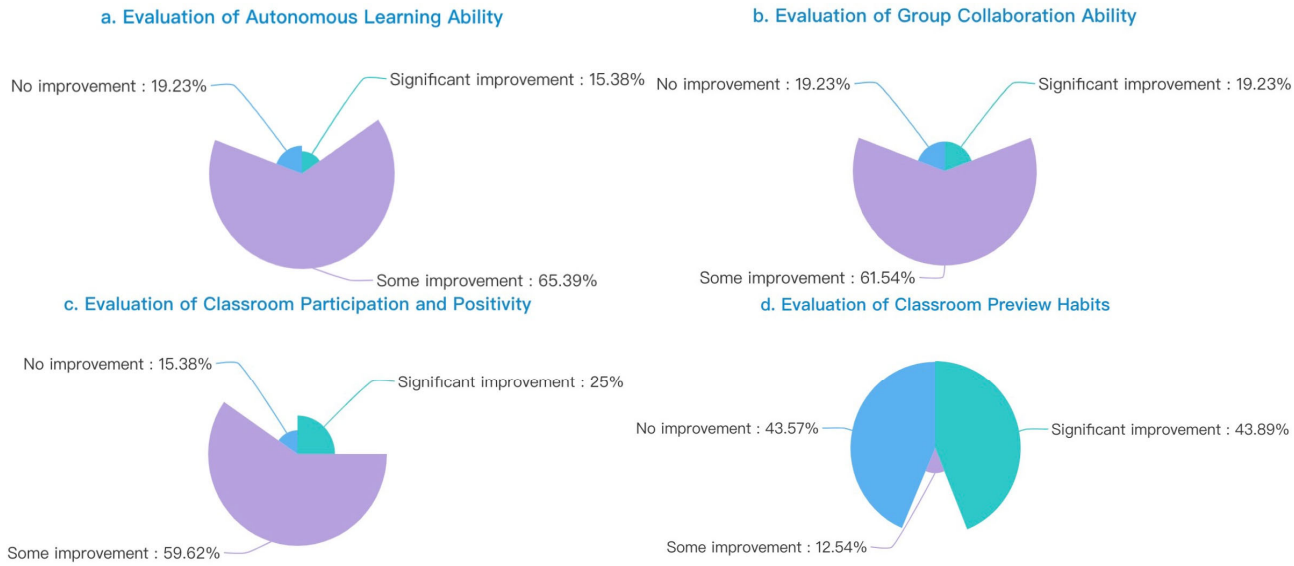

Fig. 5. Evaluation of students' learning ability and attitude towards information technology.

In addition, it was found in the survey (Fig. 5c) that the majority of students hold a positive attitude towards classroom participation and enthusiasm for blended learning, with 25% of students believing that there has been a significant improvement and 59.62% of students believing that there has been a specific improvement. By utilizing blended learning methods, students' participation in the classroom has been dramatically improved, while also effectively addressing the phenomenon of lack of concentration and easy deviation in traditional teaching processes. The survey also found (Fig. 5d) that although more than half of the students believe that after a semester of blended learning, they have gradually formed the habit of pre-class preparation, the proportion of students who have not made progress in this area is still as high as 48.08%. After analyzing the reasons for this situation, the author believes that, on the one hand, it may be because students have not fully developed their preview ability, and on the other hand, it may also be because, in middle school, there is a lot of learning pressure in other exam subjects, students are unwilling to spend much time studying information technology courses.

From Fig. 6, 86.54% of students believe that their teaching guidance is satisfactory, and blended learning can enable them to obtain help promptly, on time in the first, middle, and last stages of the classroom when they have questions. From the results of the survey (Fig. 7), the majority of students hold a positive attitude towards overall satisfaction with blended learning, with 28.85% of them being very satisfied and 48.08% being satisfied. Overall, utilizing the various teaching resources available on online platforms allows students to preview and strengthen their knowledge after class. During class learning, students can have group discussions on the problems they encounter in face-to-face classes. For classroom expansion, they can also discuss and communicate with classmates online.

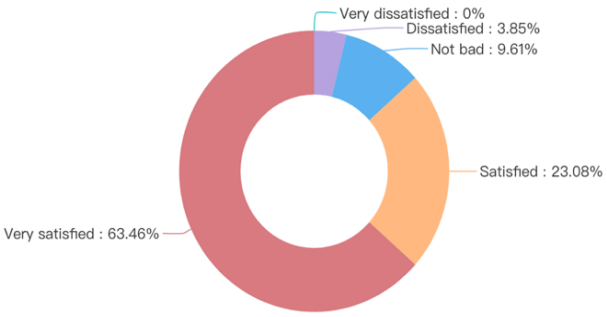

Fig. 6. Evaluation of students' learning ability and attitude towards information technology.

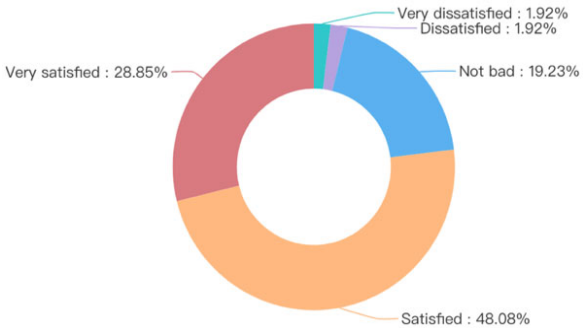

Fig. 7. Evaluation of students' overall satisfaction with mixed teaching.

B. *Result Analysis of Students' Creativity Level*

This survey conducted an empirical study on the creativity level of experimental class students using the

Williams Creativity Tendency Scale, mainly analyzing the impact of blended learning-based information technology curriculum teaching practice on students' creativity, and providing practical suggestions for the improvement and evaluation of junior high school students' creativity.

The Williams Creative Tendency Questionnaire was distributed twice. The pretest questionnaire was in the form of a paper questionnaire. A total of 52 questionnaires were distributed in September 2022, and 52 valid questionnaires were collected, with a 100% effective rate. The post-test questionnaire was distributed in January 2023. Due to the impact of the local epidemic, it was distributed and collected online through the questionnaire star. 52 valid questionnaires were collected, with an effective rate of 100%.

The total score of the Williams Creativity Tendency Test questionnaire is 150 points. The overall scores of 52 students who submitted valid questionnaires before and after the test are shown in Table I.

TABLE I. OVERALL SCORE BEFORE AND AFTER THE WILLIAMS CREATIVE TENDENCY SCALE

	Full score	Average value	Median	Lowest score	Maximum score
Pretest	150	95.288	95	71	125
Posttest	150	106.769	108	88	132

From Table I, it can be seen that the average overall score before and after the scale increased from 95.288 points to 106.769 points, an increase of 11.481 points. Based on this data, we can see that the educational practice implemented by the author has a significant effect, and the creativity level of students has significantly improved.

Secondly, the author conducted a normality test on the collected sample data. As the sample size in this study was 52 and belonged to the small sample category, the Shapiro-Wilk test was performed on the data. If the data presented significance ($p < 0.05$), it indicates rejection of the original hypothesis (the data conforms to a normal distribution), and the data does not meet a normal distribution. Otherwise, it indicates that the data meets a normal distribution. The normality test results of the pre and post-test data are shown in Table II.

TABLE II. NORMALITY TEST BEFORE AND AFTER THE WILLIAMS CREATIVE TENDENCY SCALE

Variable name	Median	Average value	Standard deviation	Skewness	Kurtosis	S-W inspection
Pretest total score	94.5	95.288	10.973	0.417	0.039	0.976(0.375)
Adventurous pretest	21	21.942	3.691	0.619	0.553	0.969(0.187)
Curiosity pretest	25.5	25.635	5.243	0.413	0.704	0.972(0.263)
Imagination pretest	24	24.25	5.426	0.098	−0.113	0.979(0.495)
Challenging pretest	22.5	23.462	5.256	0.239	−0.657	0.973(0.277)
Posttest total score	107.5	106.769	10.034	0.153	−0.26	0.985(0.747)
Adventure Posttest	24	24.442	3.616	0.004	0.242	0.986(0.781)
Curiosity Posttest	27	28.462	5.352	0.322	−0.531	0.971(0.233)
Imagination Posttest	26	26.981	5.454	0.17	0.422	0.974(0.296)
Challenging Posttest	27	26.885	4.672	0.024	−0.817	0.972(0.255)

As shown in Table II, for each data sample N < 5000, the S-W test was used, and the significance p-values were all > 0.05. The level did not show significance, and the original hypothesis cannot be rejected. Therefore, the data all met the normal distribution.

TABLE III. RESULTS OF WILLIAMS' CREATIVITY TENDENCY TEST BEFORE AND AFTER THE EXPERIMENT

Paired Variables	Average value ± Standard deviation			t	df	P	Cohen's d
	Pairing 1	Pairing 2	Paired Differences				
Adventure pretest paired with adventure posttest	21.942±3.691	24.442±3.616	−2.5±0.075	−9.365	51	0.000***	1.299
Curiosity pretest paired with curiosity posttest	25.635±5.243	28.462±5.352	−2.827±-0.109	−4.775	51	0.000***	0.662
Imagination pretest paired with imagination posttest	24.25±5.426	26.981±5.454	−2.731±-0.027	−4.94	51	0.000***	0.685
Challenging pretest paired with challenging posttest	23.462±5.256	26.885±4.672	−3.423±0.584	−5.075	51	0.000***	0.704

Note: ***, **, * represent significance levels of 1%, 5%, and 10%, respectively.

After accepting the original assumption of a normal distribution of small sample data, the data was imported into SPSS for a paired sample t-test to analyze whether the p-values of each paired sample showed significance ($p < 0.05$). If significance is present, rejecting the original hypothesis indicates a difference between each paired

sample. Conversely, it indicates no significant difference between each paired sample. Meanwhile, Cohen's d value represents the magnitude of the difference effect, and a value less than 0.2 indicates a minimal magnitude of the difference; A value of [0.2, 0.5] indicates a slight difference in magnitude; Values between [0.5, 0.8] indicate a moderate degree of difference; A value greater than 0.8 indicates a significant difference, as shown in Table III.

From the above table, it can be seen that the paired sample t-test results show that the paired significance p-values of both the pre and post-tests are 0.000***, showing significance at the horizontal level, rejecting the original hypothesis. Therefore, there is a significant difference between the pretest paired and posttest. Based on the variable risk pretest and paired risk posttest, the difference amplitude Cohen's d value is 1.299, and $t(51) = -9.365$, which is very significant; The pretest of curiosity paired with the post-test of curiosity showed a Cohen's d value of 0.662 and $t(51) = -4.775$, with a moderate difference in magnitude; The pretest of imagination paired with the post-test of imagination showed a Cohen's d value of 0.685, with $t(51) = -4.94$, indicating a moderate degree of difference; The challenge pretest paired with the challenge post-test showed a Cohen's d value of 0.704 and $t(51) = -5.075$, with a moderate difference.

According to the pre and post-test data of the Williams Creativity Tendency Scale, it can be seen that the total scores and four dimensions of the experimental class students in the post-test are higher than those in the pretest. Through data analysis, it is found that there are significant differences, which fully indicates that the creativity level of the experimental class students has been improved after teaching practice.

V. Conclusion and Reflection

Based on the above analysis of teaching practice effectiveness, the satisfaction survey of teaching effectiveness conducted on students, and the analysis of students' creativity level results using the Williams Creativity Tendency Scale, it can be seen that the blended teaching model based on junior high school information technology skills courses has gained students' recognition. Through teaching practice, students not only have a good grasp of the basic knowledge and operational skills of computers, but also have a certain level of computational thinking, which can be applied to their own lives. In addition, during the learning process, their autonomy, participation, enthusiasm, and teamwork ability have all been significantly improved, meeting the needs of the new curriculum standards for cultivating comprehensive information literacy among junior high school students.

Due to various reasons, such as varying levels of students and the pace of teaching development in different regions, the practical research on the blended teaching model based on junior high school information technology skills courses is still in the initial exploration stage, without a complete and mature fixed paradigm. From the results of this practice, it can be seen that this study can have a positive impact on students' learning outcomes to a certain extent, cultivating their various abilities, but at the same time, it also reveals some problems that are worth pondering and improving, for example, further expansion of online platform functions, further optimization of the evaluation system, and further improvement of teaching mode [15].

Conflict of Interest

The author declares no conflict of interest.

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