Retraction

Retracted: Exploring the Application of Online Teaching Platform in the PBL Teaching Mode of Film and Television Courses for Teacher Trainees

Mobile Information Systems

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

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

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

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

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

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

References

[1] J. Peng and M. Yuan, "Exploring the Application of Online Teaching Platform in the PBL Teaching Mode of Film and Television Courses for Teacher Trainees," *Mobile Information Systems*, vol. 2022, Article ID 2289981, 13 pages, 2022.

Research Article

Exploring the Application of Online Teaching Platform in the PBL Teaching Mode of Film and Television Courses for Teacher Trainees

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The aim of the study is to deeply study the effect of the PBL teaching mode in improving students' problem-solving ability, learning interest and autonomous learning ability. This study takes the practice teaching of film and television courses for normal students as the research object, constructs a general network teaching platform based on B/s and PBL teaching mode, deeply investigates the teaching status of film and television production practice courses, and selects the experimental class and control board to test the PBL teaching mode. The test results show that 13 students in the experimental class have a general learning attitude, 12 students have a good learning attitude, 7 students have a good learning attitude, and 5 students have a very correct learning attitude. This shows that 24 students have a positive learning attitude in the PBL teaching mode, which shows that they are very interested in learning information technology courses. At the same time, it also verifies the feasibility of the PBL teaching mode. At the same time, on this basis, this study puts forward some suggestions for the optimization of PBL teaching design under the network teaching platform.

1. Introduction

At this stage, with the development of information technology, China's information technology curriculum has also developed to a certain extent. However, there are still some problems in the current information technology curriculum, such as single teaching mode, relatively poor teaching effect, and low students' interest in learning. The proposal of the PBL teaching mode is helpful to improve these problems [1]. Of course, the PBL teaching mode is mainly used in the medical field. The so-called PBL teaching mode is a set of teaching methods for designing learning situations, which can also be regarded as project-based teaching methods or problem-based learning methods. The earliest application in the field of medical education is a problem-oriented and student-centered teaching method. This teaching model can make students gradually become the role in the problem situation, and teachers can also design and arrange the content of the course around a complete problem, actively encourage students to learn knowledge related to the problem, and then better solve the problem. Of course, by creating a specific learning environment, teachers also help to stimulate students' independent thinking, actively encourage students to ask questions, and constantly guide students to solve problems [2].

2. Literature Review

Some scholars believe that PBL is a teaching method. For example, PBL is a situational teaching method that takes problems as the starting point of teaching activities, so as to teach courses, take students as the center, and solve real problems; Royle believes that PBL is a student-centered teaching method that "anchors" learning in problem

situations. Some scholars define it as a teaching method. For example, Saville believes that PBL is a teaching method that takes learners as the center and learners apply their knowledge and skills to develop solutions to a specific problem [3]; Qi et al. believe that PBL is a teaching method based on the design of problems close to reality to cultivate students' knowledge system, problem-solving ability, high-order thinking ability, and cooperative communication ability. Most domestic scholars define PBL as a teaching mode [17]. For example, Li et al. believe that PBL is a teaching mode that focuses on problems, allows students to construct knowledge according to problems, guides students to master basic knowledge, and develops high-level thinking skills, problem-solving ability, and autonomous learning ability [4]; Hu believes that PBL is a teaching model that puts students in specific problem situations and encourages students to carry out organized and in-depth inquiry learning on problems through autonomous and cooperative learning [5]; Sanjeev et al. put forward that PBL is a teaching model worthy of reference. It takes problems as the basis. Learners think and analyze problems, query materials, actively learn knowledge, and improve students' thinking skills [6].

With the deepening of PBL research, PBL has obviously developed into a teaching model. In the problem environment, according to the existing knowledge and experience and the help of the outside world, students can independently study and explore the hidden knowledge in the problem in the form of group cooperation. In the PBL classroom, the role of teachers has changed greatly. Teachers are not only rule makers, but also instructors and supervisors in the classroom. Students have become the main body of the PBL classroom and their status in the classroom has been improved.

3. Network Teaching Platform Based on *B/S*

3.1. Framework Design of Network Teaching Platform.
After logging into the system, you can enter three subsystems: test question bank management subsystem, online examination subsystem, and online learning subsystem. In order to clearly explain the system framework and have a preliminary understanding of the system process as a whole, the main process of the system is given as shown in Figure 1.

The system is divided into a task manager module and a student work module according to the task. The main functions of the system are shown in Figure 2.

The system is composed of a test question bank management subsystem, online examination subsystem, and online learning subsystem (basic teaching subsystem of Computer Culture).

3.2. Database Design of Network Teaching Platform

3.2.1. Database Planning.
First, establish the access database, store the examinee's personal information and the test questions of each course in the database "test_database. MDB," and store it in the data directory of the

system the database "test_database. MDB" contains the following 8 data tables: administrator table (admin), examinee file table (student), examinee examination record table (report), examination paper table (test), judgment question table (Type1), single choice question table (type2), blank filling question table (type3), and multiple topic table (type4).

3.2.2. E-R Diagram Analysis.
According to the total data structure of the designed test question bank system, using an E-R diagram, and according to the system analysis and module design of the system, we can make various entities that can meet the needs of users and the relationship between them. According to the above plan, the system plans out: the administrator information entity, student information entity, test paper information entity, examination information entity, judgment question entity, single choice question entity, multiple choice question entity, and blank filling question entity. Figure 3 shows the E-R diagram of the system database.

The entity diagram of platform system administrator information is shown in Figure 4.

The student information entity diagram of the platform system is shown in Figure 5.

The examination information entity diagram of the platform system is shown in Figure 6.

The physical diagram of test paper information of the platform system is shown in Figure 7.

The entity diagram of platform system judgment question is as shown in Figure 8.

The entity diagram of single choice questions of the platform system is shown in Figure 9.

The multi-topic entity diagram of the platform system is shown in Figure 10.

The entity diagram of filling in the blanks of the platform system is shown in Figure 11.

3.2.3. Database Table Design.
There are three fields in the administrator table: administrator ID, administrator account, and administrator password. The contents are shown in Table 1.

This form includes the candidate's personal information, name, student number, and registration date. The contents of the student information table are shown in Table 2.

This form records the examinee's number, test date, test score, etc. If a make-up examination is required, the make-up examination field is true, and the make-up examination date and score are recorded at the same time. The contents of the candidate information table are shown in Table 3.

You can specify the number of each question type of the test paper and randomly select the test questions from the test question library to generate an original test paper. The contents of the test paper information table are shown in Table 4.

The judgment question table records the judgment question stem and answer set by the administrator, as well as the addition date. Its design table is shown in Table 5.
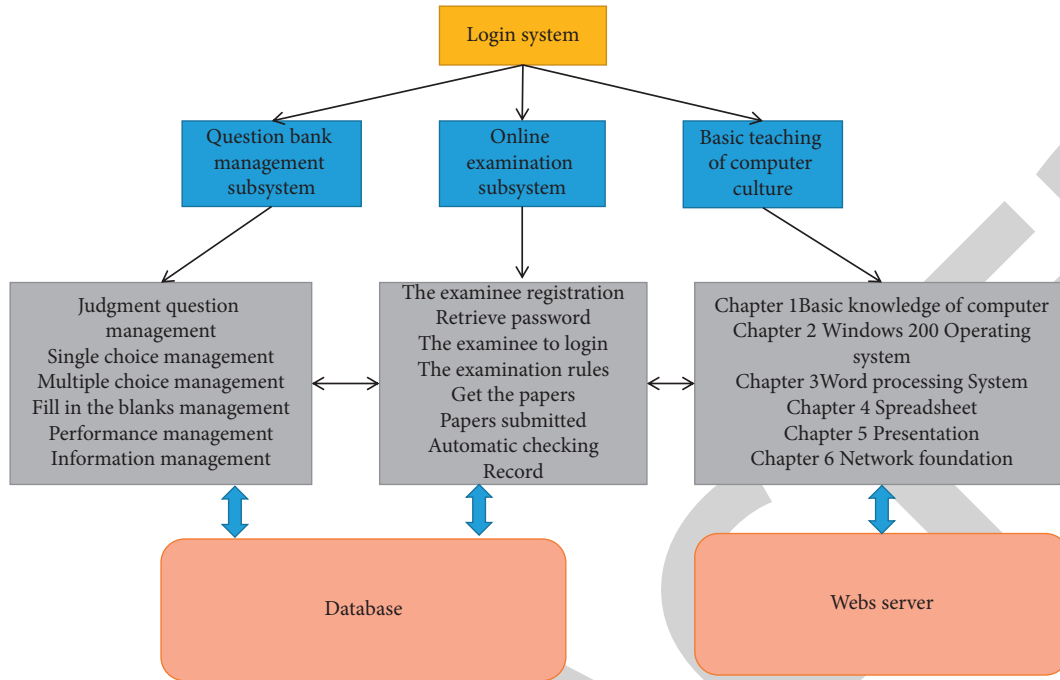
Figure 1: Main process of system design.

The single choice question table records the single choice question stem and answer set by the administrator, as well as the joining date. Its design is shown in Table 6.

The multi-choice question table records the multi-choice question stems and answers set by the administrator, as well as the joining date. Its design is shown in Table 7.

The blank filling form records the blank filling stem and answers set by the administrator, as well as the addition date. Its design is shown in Table 8.

This section studies and develops a web-based network teaching platform. The teaching platform is composed of test question bank management subsystem, online examination subsystem, and online learning subsystem. It mainly studies test question management, test paper management, online examination, score management, information management, online learning subsystem, and so on. There are four types of examination questions: judgment questions, single choice questions, multiple-choice questions, and blank filling questions, which are authorized by administrators and students.

4. Experimental Research on PBL Teaching Mode in Curriculum

4.1. Preliminary Preparation of the Study. Before carrying out PBL teaching, this study conducted a questionnaire survey on each class of Grade 8 in junior middle school. The questionnaire is mainly composed of five dimensions: problem-solving ability, learning interest, cooperative learning ability, autonomous learning ability, and information ability. According to the analysis of the survey results, it is found that there are significant differences between class 8 of Grade 8 and class 5 of Grade 8 in the dimension of autonomous learning ability, but there are no significant

differences in problem-solving ability, learning interest, cooperative learning ability, and information ability. Therefore, this study takes all the students in these two classes as the research object [7, 8]. The quasi-experimental research of PBL teaching is carried out with the unit of animation design in the first volume of information technology of Grade 8 published by Tsinghua University Press as the teaching content. In the early stage of the experiment, this study takes class 5, Grade 8 of s middle school as the experimental class and class 8, Grade 8 as the control class. In order not to affect the normal teaching activities of the school, this study selects two classes in a normal way, and the researcher carries out the experiment as a teacher.

The specific experimental scheme is shown in Table 9:

The independent transitions in this experiment are multidisciplinary, and the main differences are the students' problem-solving skills, collaborative learning, independent learning, enjoys learning, and literacy. The content of the two classes is the same, and the classes are two hours a week.

4.2. Research Process

4.2.1. Early Stage of PBL Teaching. According to the content of animation design, create problem situations, ask questions, and guide students to analyze problems. Then, the teaching of the first module "getting to know components" was carried out. According to the content of this module, this study has made the following teaching design and implemented classroom teaching. The specific target framework and contents are shown in Table 10:

Before PBL teaching, learners have learned the basic operation of Flash software, including basic animation production skills such as importing image modification,
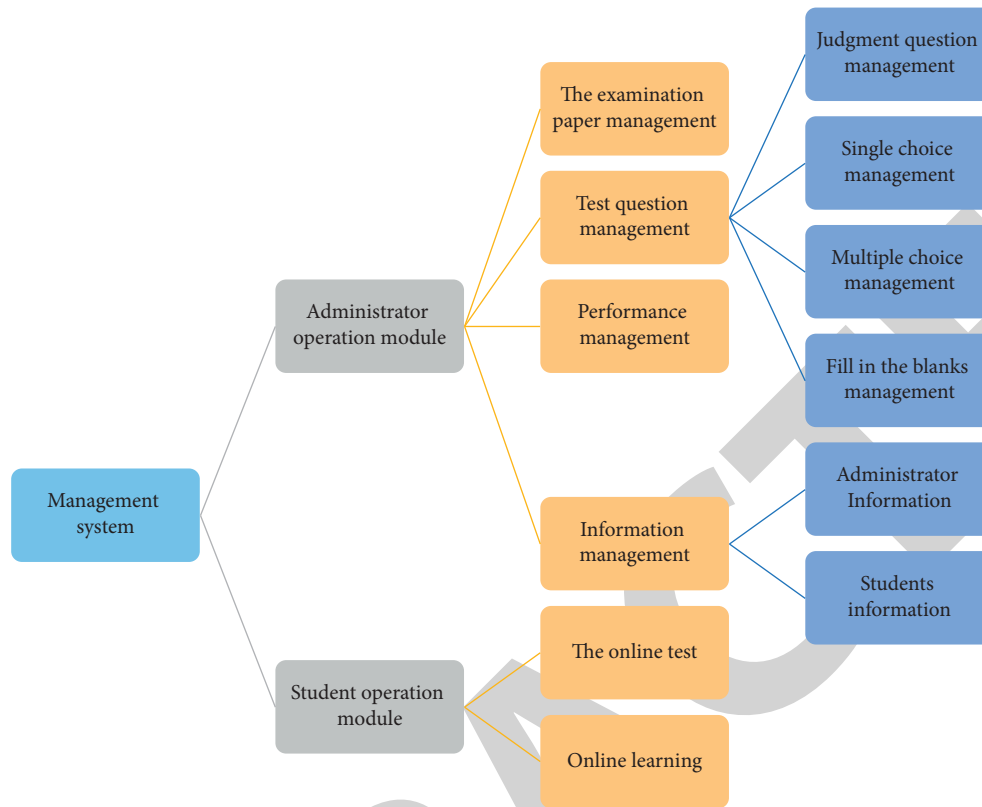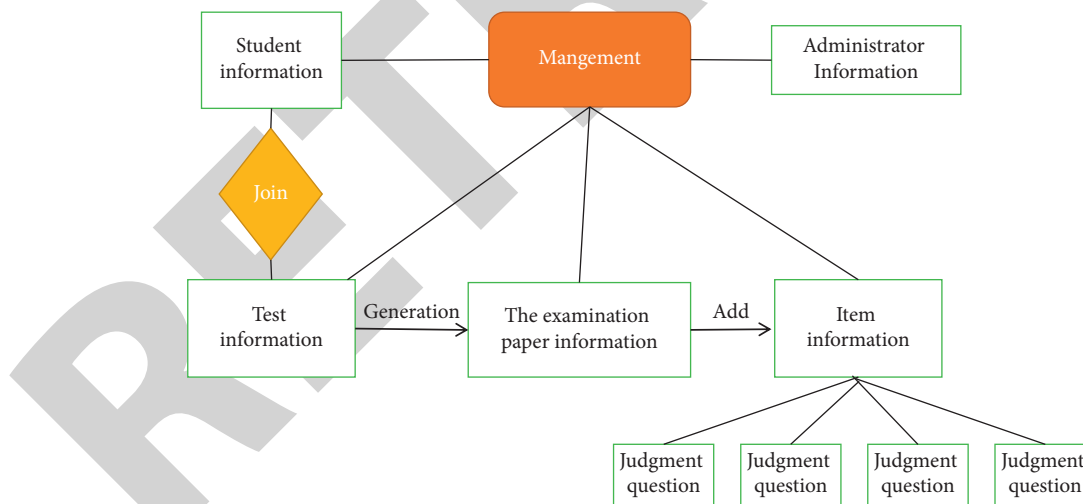
Figure 2: System function division.

Figure 3: E-R diagram of system database.

frame-by-frame animation, creating gap shape, and drawing image, which lays a foundation for the learning of components. In the past, learners only need to imitate the teacher's operation steps to complete the exercises. In the PBL teaching mode, learners mainly rely on self-study and group discussion to learn new knowledge and skills. For the eighth-grade students, the content of the component module is not difficult. Therefore, in this module teaching, teachers will teach according to the

characteristics of PBL teaching and students' current learning situation, so that students can gradually adapt to the PBL teaching mode.

4.2.2. Middle Term of PBL Teaching. Guide layer animation is the learning content of classes 9–10 in PBL teaching this semester. In animation, there is often an animation effect that an object moves along the preset path. We call it to guide

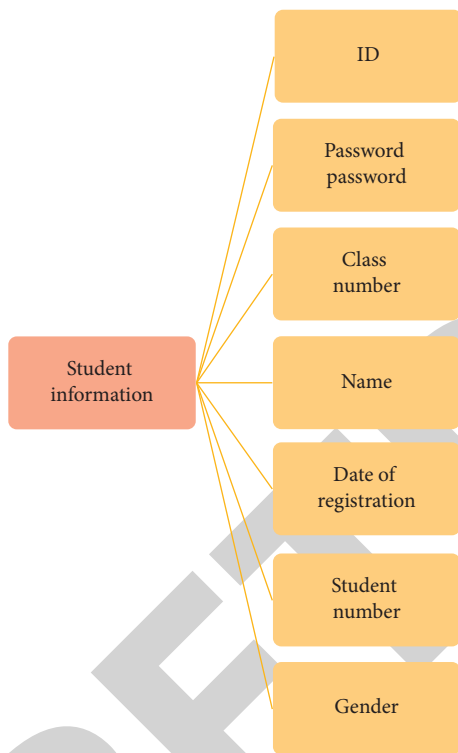FIGURE 4: Entity diagram of administrator information.

FIGURE 5: Entity diagram of student information.

layer animation. It is widely used in flash animation. The guide layer animation is an extension of the traditional patching animation. Therefore, learning the guide layer animation well also lays a foundation for the comprehensive application of students' flash works [9]. Teaching objectives are shown in Table 11:

4.2.3. Later Stage of PBL Teaching. In the later stage of PBL teaching, the teacher spent two class hours to complete it, mainly for each group to display the animation greeting card works of the group, the team leaders and teachers of each group to score the works, and the students give scores for their cooperative learning and learning attitude with the group members according to the corresponding evaluation criteria [10]. The specific process is shown in Table 12.
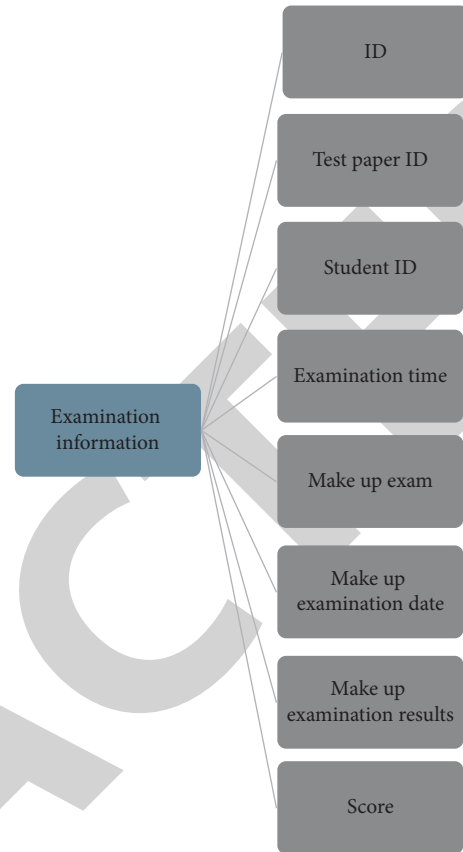

FIGURE 6: Entity diagram of examination information.

4.3. Experimental Effect Analysis of PBL Teaching Mode. As shown in Table 13, prior to the experiment, Sig (two sides) value of the four dimensions of the laboratory and control room, problem-solving skills, learning satisfaction, collaborative learning, and capacity of data, was greater than 0.05. There is no significant difference between the test room and the control room in these four dimensions. The Sig (two-way) measure of independent learning ability was less than 0.05 and higher than 0.01, indicating differences in self-study ability between the experimental room and the control room.

4.3.1. Effect Analysis of Problem Capability Dimension. To understand the possible changes in the solutions of the two students after the intervention experiment, we analyzed the pre and posttest data to test students' problem-solving skills in Grade 2, as described in Table 14. Prior to the test, the accuracy of the test room was 3.44 and the average score of the control room was 3.54, and the average of the test center was slightly lower than that of the control room. From the results of the two-variable solution potential t-test, we can see that the Sig value (two tails) is greater than 0.05 before the test. This shows that there is no significant difference in the density of the pretest laboratory and the control room. After the test, the average density of the test room was 4.04 and the average control room was 3.69. The
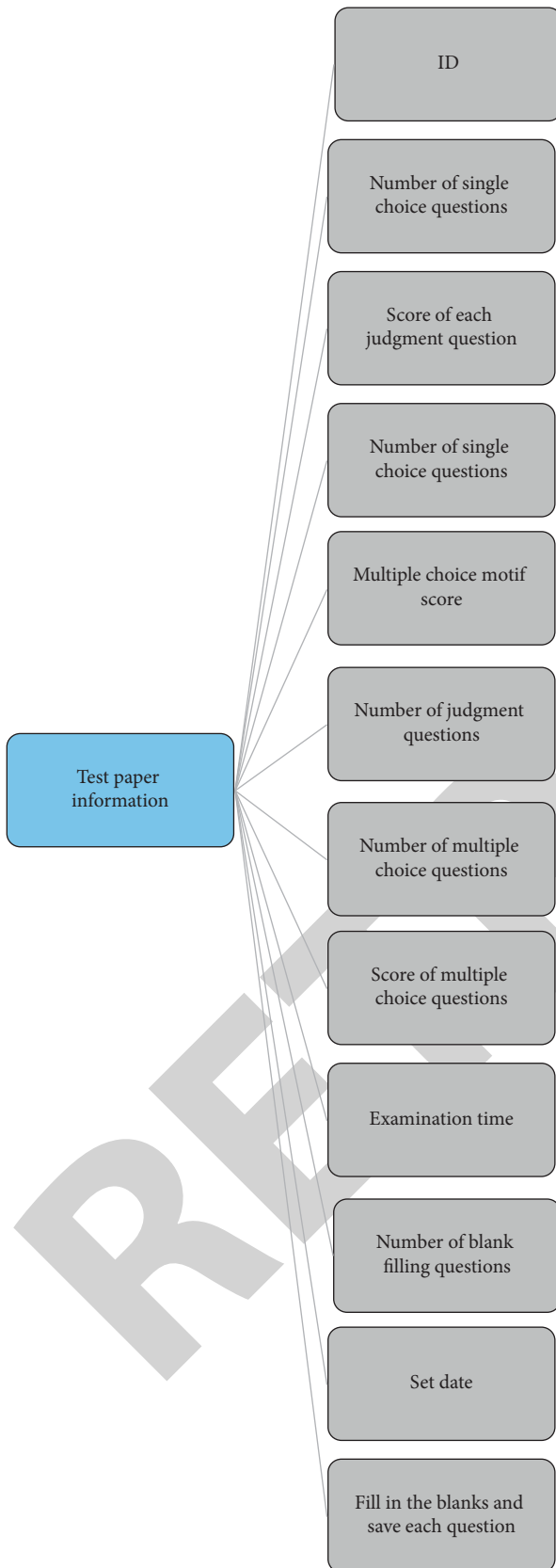
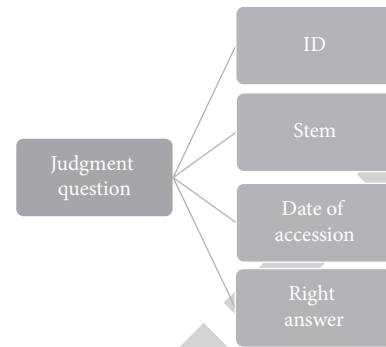FIGURE 7: Entity diagram of test paper information.

FIGURE 8: Entity diagram of judgment question.

average laboratory score is higher than that of the control room. Although the compactness of the two classes improved compared to the pretest results, the improvement of the experimental classes was much higher than that of the control classes [11]. After solving the two classifications, the Sig value in the standard difference of the experimental data is less than 0.05, which indicates that the experimental data after the capacity difference show that the solutions of the two classes are not the same and have significant differences. There is no other way to determine between the two classes. Therefore, based on the t-test scores of the test and control classes (posttest): If the Sig (double-tailed) value is less than 0.01, it can be concluded that there is a difference in the laboratory's problem-solving capacity. Control room before and after the test. This is shown in Table 15.

Problem-solving ability is the comprehensive ability of students in solving problems. The reason why there is a significant difference between the control class and the experimental class is mainly because in the experimental class, teachers will guide students' main tasks in each link step by step according to the PBL teaching mode process. PBL teaching mode mainly formulates a set of detailed steps to solve problems based on problem solving. Although in the early stage of the experiment, students are still unclear about the process of PBL teaching mode. However, in each module teaching, teachers will design corresponding problem situations according to the teaching content [12]. Under the guidance of teachers, students find problems, analyze and solve problems, and gradually adapt to and get used to this set of the problem-solving process and form a problem-solving thinking mode. In the control class, teachers mainly use lecture teaching methods and teach according to the content of teaching materials. Although most students can master the operation skills demonstrated by teachers in class, once they encounter problems and cannot find the answer, most students will choose to give up and solve this problem. Therefore, once the hypothesis is established, compared with the traditional teaching mode, the PBL teaching mode is more conducive to improve students' problem-solving ability [13]. This is shown in Table 16.
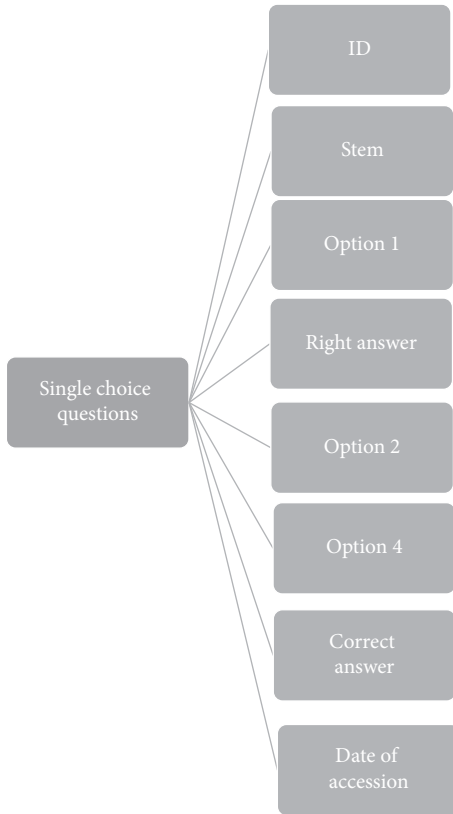
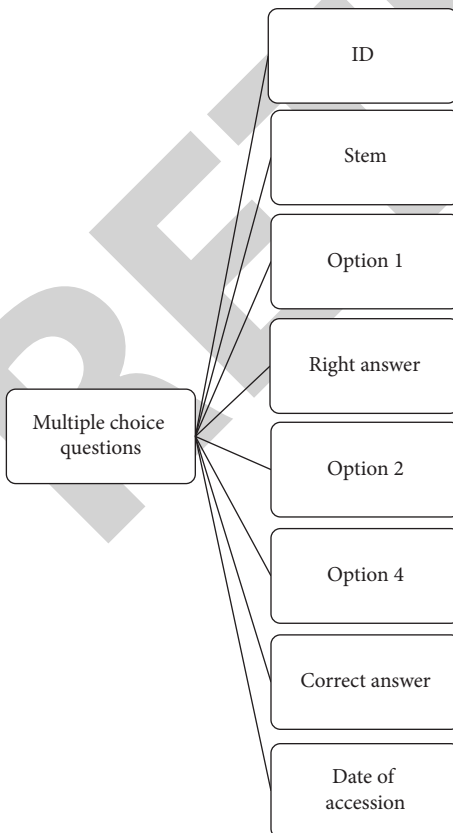Figure 9: Entity diagram of single choice questions.
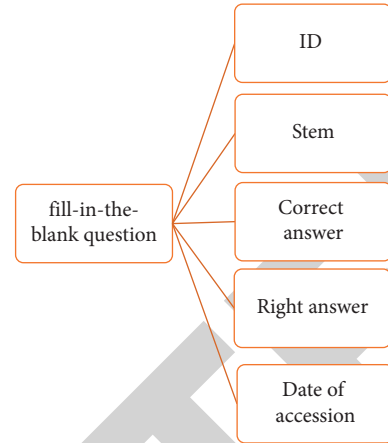

Figure 10: Entity diagram of multiple topics.

Figure 11: Entity diagram of blank filling questions.

Table 1: Administrator table.

Field name	Meaning	Data type
ID	Administrators	Auto number
Account number	Administrator account	Text
Password	Administrator password	Text

Table 2: Student information.

Field name	Meaning	Data type
ID	Student number	Auto number
Full name	Student name	Text
Password	Password	Text
Gender	Gender	Text
Class number	Class number	Text
Student number	Student number	Text
Date of registration	Date of registration	Date/time

4.3.2. Analysis on the Effect of Learning Interest Dimension. To understand changes in student interest in both classes after the experiment, we analyzed pretest and posttest data from information on student interest in both classes. Prior to the experiment, the laboratory average score was 3.97, the control room score was 4.06, and the laboratory average score was slightly lower. The pretest t-test students' interest in learning showed that the pretest Sig (double-tailed) value was >0.05, indicating that there was no difference between student satisfaction in the laboratory and in the control room Before the test. In the event of a test discrepancy after the survey data have been provided, the Sig value >0.05 and the difference between the two samples can be detected in the same way [1]. After eliminating the effects on students' early learning interest after the experiment, the average of the pilot classes was 4.14 and the average of the control classes was 3.92. The average laboratory score is higher than that of the control room. Based on a one-sided comparison of learning satisfaction, $0.01 < \text{Sig} = 0.037 < 0.05$ indicates that learning in experimental and control classes eliminates the effects of the previous testing. This is shown in Table 17.

Students' learning attitude in class can also reflect students' learning interest to a great extent. In order to make the research results convincing, this study

TABLE 3: Examination information.

Field name	Meaning	Data type
ID	Examination record No	Auto number
Test paper ID	Test paper ID	Number
Student ID	Student ID	Number
Fraction	Test score	Number
Examination date	Examination date	Date/time
Make-up exam	Make-up exam	Yes/no
Make-up examination results	Make-up examination results	Number
Examination date	Make-up examination date	Date/time

TABLE 4: Test paper information.

Field name	Meaning	Data type
ID	Test paper No	Auto number
Number of judgment questions	Number of judgment questions	Number
Score of each judgment question	Score of each judgment question	Number
Number of single choice questions	Number of single choice questions	Number
Number of single choice questions and score of each question	Score of single choice questions	Number
Number of multiple choice questions	Number of multiple choice questions	Number
Score of multiple choice questions	Multiple choice media score	Number
Number of blank filling questions	Number of blank filling questions	Number
Score of each blank filling question	Score of single blank filling question	Number

TABLE 5: List of judgment questions.

Field name	Meaning	Data type
ID	Judgment question number	Auto number
Stem	Stem	Text
Right key	Right key	Yes/no
Date of accession	Date of accession	Date/time

TABLE 8: Blank filling form.

Field name	Meaning	Data type
ID	Fill in the blanks No	Auto number
Stem	Stem	Text
Right key	Right key	Text
Date of accession	Date of accession	Date/time

TABLE 6: Single topic selection table.

Field name	Meaning	Data type
ID	No. of single choice questions	Auto number
Stem	Stem	Text
Option 1	Single choice option 1	Text
Option 2	Single choice option 2	Text
Option 3	Single choice option 3	Text
Option 4	Single choice option 4	Text
Right key	Right key	Text
Date of accession	Date of accession	Date/time

TABLE 7: Multiple topics.

Field name	Meaning	Data type
ID	Multiple choice number	Auto number
Stem	Stem	Text
Option 1	Multiple choice option 1	Text
Option 2	Multiple choice option 2	Text
Option 3	Multiple choice option 3	Text
Option 4	Multiple choice option 4	Text
Right key	Right key	Text
Date of accession	Date of accession	Date/time

statistically analyzed 50 learning attitude evaluation scales distributed to the students of the experimental class and obtained the scores. Among them, the scale mainly evaluates and measures student's learning attitude from the three aspects of participation, preparation and attendance, and then grades each student's learning attitude. In the reliability analysis of the scale, the calculated Kendall harmony coefficient (W) value is 0.675, and the evaluated objects are 50 people, $n > 7$. It is also necessary to convert the W value into x^2 value. The test shows that $x^2 = 99.24 > X^2$ (49) 0.01, indicating that the obtained w value has reached a very significant level, and the grade consistency assessed by raters is very high. The KMO value of the scale is 0.860, indicating that the scale has high validity. It is suitable for measuring students' learning attitude [5].

Among them, the learning attitude in this study is divided into five levels. Among them, 1 indicates that the attitude is not correct, 2 indicates that the attitude is general, 3 indicates that the learning attitude is good, 4 indicates that the learning attitude is very good, and 5 indicates that the learning attitude is very correct, as shown in Figure 12. Among them, 13 students in the experimental class have an incorrect learning attitude in the PBL teaching mode this semester. 13 students have an average learning attitude, 12 students have a good learning attitude, 7 students have a good learning attitude, and 5 students have a very correct learning attitude [14]. This shows that 24 students have a positive learning attitude in the PBL teaching mode,

TABLE 9: Quasi-experimental research scheme.

	Pretest	Independent variable	Posttest (dependent variable)
G1 (experimental class)	O_1	Teaching mode 1	O_2
G2 (control team)	O_3	Teaching mode 2	O_4
		Experiment time: 20 class hours	

TABLE 10: Framework of teaching objectives of "new components."

Knowledge and skills	(1) Master and understand the different knowledge and skills of graphic elements, film editing elements and button elements (2) Master the method of creating and editing components (3) Understand the library and learn to apply the library to manage components
Process and method	(1) In autonomous learning, students can learn the principle, manufacturing method, process and method of components (2) Through the form of group discussion, students can learn new knowledge and skills and begin to adapt to new learning forms
Emotional attitude and values	(1) Through the introduction of problem situation, improve students' desire to explore component knowledge (2) Initially cultivate students' autonomous learning ability and sense of cooperation (3) Through the guidance of teachers, students' emotional attitude and values ability and habits of discovering, analyzing and solving problems are preliminarily cultivated (4) After students learn new knowledge, through the guidance of teachers, cultivate students' application and innovation ability of new knowledge

TABLE 11: Framework of teaching objectives of "guide layer animation."

Knowledge and skills	(1) Master the meaning and characteristics of the guideline (2) Master the relationship between the guided layer and the guided layer (3) Learn to create guide layers and draw guide line paths
Process and method	(1) Through the creation of problem situations, stimulate students' thirst for knowledge and arouse students' thinking and discussion (2) Through the cooperation of team members, we can cultivate the awareness of team members to communicate with the old work and enrich the new work according to the group knowledge
Emotional attitude and values	(1) Improve students' interest in learning information technology courses, so that students can obtain a sense of achievement when realizing the animation effect of the guide layer (2) By creating problem situations, stimulate students' enthusiasm to explore problems, so as to cultivate students' problem-solving ability (3) Cultivate students' cooperative learning ability and autonomous learning ability in group discussion and communication (4) enhance the friendship between students when making animation works in groups

indicating that they have a high interest in learning information technology courses, and 13 students have a general learning attitude, which also shows that their interest in learning information technology courses is not high to a certain extent, and the other 13 students have an incorrect learning attitude, indicating that the teaching effect of PBL teaching mode to stimulate their interest in learning is low.

In the experimental class, one or two students in each group have low learning enthusiasm. Generally, they do not speak actively in group discussion and study by themselves. The teacher's energy is limited and cannot pay attention to the students with low learning enthusiasm in each class. But on the whole, the students in each group are serious and active in group discussion and autonomous learning. In the control class, the students only operate according to the teacher's presentation and teaching materials. Some students will talk and discuss when the teacher gives a speech. When they practice independently, when they encounter problems that cannot be solved, some students will choose to browse the web to spend their time. After finishing the exercises, only a few students in the control class will independently

learn other information technology disciplines, while other students surf the Internet and play games. Generally speaking, the control class is not enthusiastic about the exploration of information technology knowledge [15].

The main reason is that in the PBL teaching mode, teachers create interesting problem situations for students, which are closely related to reality, and students are easy to understand. Moreover, flash animation production is mainly to train students' practical ability. In the PBL teaching classroom, teachers have little teaching time. The whole classroom is mainly dominated by students' self-study and cooperative communication, which gives students enough time for hands-on practice. In addition, teachers provide students with various learning resources to facilitate students' learning [16]. PBL teaching mode not only mobilizes students' learning initiative and gives students sufficient learning resources and a good learning atmosphere, but also enables students to obtain a sense of achievement in hands-on practice and exploration, so as to stimulate students' interest in learning information technology. In the traditional teaching mode, teachers only talk about the animation

TABLE 12: Post PBL teaching content.

Teaching process	Teacher behavior	Student behavior	Design intent
Exhibition of works	Organize each group to arrange a reporter to report the idea of the work and the production process of the group work	(1) Submission of works by each group (2) Each group will arrange a student to introduce the production idea, production process and division of labor of each group member	Students practice their language organization ability by presenting their works in the whole class
Summary evaluation	(1) Make oral comments on the works of each group, point out the advantages and disadvantages of the works, and guide students to make comments on the works of other groups and reflect. At this stage, both students and teachers are evaluators and reflectors. (2) Fill in the evaluation scale (Appendix III) and evaluate the works of each group and the students' learning attitude and cooperation. (3) After class, ask two other IT teachers to evaluate the students' works and fill in the work evaluation scale	(1) The team leader of each group shall evaluate the works of this group and other groups, and fill in the work evaluation scale. (2) Students' self-evaluation and mutual evaluation of learning attitude and cooperation, and fill in the evaluation scale	In order to obtain the evaluation results of each group's works objectively and fairly. Therefore, this study will calculate the average score of three teachers' evaluation group works according to the evaluation scores of three teachers. In the stage of students' self-evaluation and mutual evaluation, students can initially realize their learning ability

TABLE 13: T-test of independent samples before test.

	Variance homogeneity test		T-test of mean variance		
	F	Sig	T	df	Sig (bilateral)
Problem-solving ability	0.076	0.783	1.047	96	0.298
			1.045	93.472	0.299
Learning interest	2.525	0.115	0.602	96	0.549
Cooperative learning ability	1.765	0.187	−0.743	96	0.459
			−0.739	88.436	0.462
Autonomous Learning Ability	0.413	0.522	2.088	96	0.993
			2.092	94.102	0.993
Ability information	0.557	0.457	0.008	96	0.993
			0.008	94.102	0.993

TABLE 14: T-test data of independent samples before and after the test of problem-solving ability of experimental class–control class.

		Class	N	Variance homogeneity test			T-test of mean equation		
				Average	F	Sig	T	df	Sig (bilateral)
Problem-solving ability	Pretest	Control class	48	3.5365	0.076	0.783	1.047	96	0.298
		Experimental class	50	3.4400			1.045	93.472	0.299
	Posttest	Control class	48	3.6917	4.343	0.040	−2.858	96	0.005
		Experimental class	50	4.0360			−2.839	84.690	0.006

TABLE 15: T-test results of problem-solving ability in experimental class and control class (posttest–pretest).

	Variance homogeneity test		T-test of mean equation		
	F	Sig	T	df	Sig (bilateral)
Problem-solving ability	0.126	0.723	−3.445	96	0.001
			−3.436	93.392	0.001

Table 16: Statistical data before and after the experimental class — the control class's learning interest.

Learning interest		Class	N	Average	Variance homogeneity test	
					F	Sig
	Pre-test	Control class	48	4.0573	2.525	0.115
	Posttest (eliminate the influence of pretest)	Control class	48	3.921	0.024	0.818
			50	4.140		

Table 17: One-way covariance analysis of learning interest.

Source	Class III sum of squares	Df	Mean square	F	Significance	Local ETA square
Modified model	1.170[a]	2	0.585	2.231	0.113	0.045
Intercept	52.927	1	52.927	201.852	0.000	0.680
Class	1.170	1	1.170	4.463	0.037	0.045

production steps for students according to the teaching materials. Students imitate the teacher's steps to make works, but when they encounter difficulties in animation production, they lack the awareness of active help seeking, and do not feel the sense of achievement of making works in their study, so students will be afraid and bored of information technology courses. Therefore, hypothesis 2 is established. Compared with the traditional teaching mode, the PBL teaching mode is more conducive to maintaining and improving students' learning interests [17].

4.4. PBL Teaching Mode Design

4.4.1. Curriculum Teaching Goal Design. In the online course designed based on PBL, knowledge is not taught directly by teachers to students, but acquired and formed by students in building the problem framework, exploring solutions, and making effective decisions. Therefore, the design of knowledge objectives is very important and difficult. Teachers should design the unit knowledge to be learned into problem situations. When designing, we should consider how to closely connect the learning of knowledge with problem situations and learning tasks according to the teaching materials. The ability to solve problems is called a skill goal, including thinking ability, cooperation ability, application information, evaluation information ability, and so on. The design focuses on allowing the diversity and hierarchy of problem solving [18].

4.4.2. Course Content Design. PBL is based on problems, so the design of problems is very important and should contain the basic structure of the discipline.

According to the knowledge and skill objectives of the course, it is proposed to take the "class student achievement management system" as the teaching example at the early stage of the course teaching, which runs through the whole teaching process. PBL usually encourages active learning and self-directed development, so corresponding to the multiple goals that PBL can achieve, PBL emphasizes integrated evaluation and situational evaluation, and suggests combining student evaluation with tutorial evaluation. Such an evaluation process is integrated with the learning process
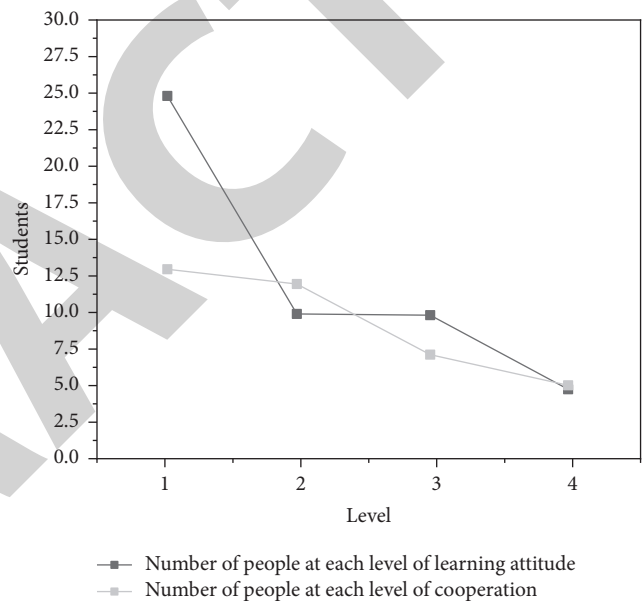

Figure 12: Statistical chart of learning scale.

and implemented in the way of authenticity. It is embedded, transparent, dynamic, continuous, nontraditional and nonclosed orientation [19]. The teaching process is usually evaluated by the combination of group member evaluation, self-evaluation, and teacher evaluation. Teachers should guide students to summarize their experience or harvest in the whole problem-solving process and reflect on the shortcomings in the problem-solving process, so as to enable students to connect relevant concepts, specific skills, and strategies with the current problem categories and form a more coordinated understanding of this problem.

4.4.3. Embedded Design Course. According to the arrangement of time, teachers provide problem situations on the network teaching platform in advance before class, so that the learning group can discuss problems after class. In the process of classroom teaching, let students realize specific operation, analyze problems onsite, design algorithms, and write programs. Create a better classroom discussion atmosphere and improve students' interest in classroom learning. Students

adopt collaborative learning to carry out after-school learning. The group includes 4 members to explore and determine problem solutions. The performance of group members in cooperation and their contributions to the group are important reference factors in the formation of group mutual evaluation. Teachers arrange a fixed time for counseling every week after class, participate in group discussions, and timely correct and guide students to solve problems [20].

5. Conclusion

The teaching content selected in this experiment is practical flash animation production, focusing on cultivating students' practical ability. Eighth-grade students have mature logical thinking ability. Influenced by the traditional teaching mode, students are used to learning knowledge and solving problems through teachers' explanation. Therefore, for the students in the experimental class, in the "asking questions" stage, teachers guide students' learning initiative by creating real problem situations. In the "problem analysis" stage, under the guidance of teachers, students analyze the problems to be solved, stimulate students' desire to explore and cultivate students' analytical ability. In the "problem solving" stage, students can find ways to solve problems in autonomous learning and cooperative communication according to the analyzed problems, so as to create works. And in the process of solving this problem, students will encounter new problems, and the PBL teaching mode provides students with freedom of communication and discussion and learning resources. Learners improve their problem-solving ability in the process of discovering, analyzing, and solving problems. In the control class, students learn new knowledge through teachers' teaching and understanding of teaching materials. They only master the production methods and skills, and lack the process of hands-on exploration. According to the analysis of the data obtained in this experiment, it can be seen that after the experiment, the students in the experimental class are significantly more interested in information technology than the students in the control class. Through PBL teaching mode, teachers can create a good learning atmosphere for students and provide rich learning resources. Therefore, the PBL teaching mode in junior middle school information technology curriculum is conducive to improving students' interest in learning.

Data Availability

The labeled dataset used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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