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An Empirical Study on Improving the Teaching Effect of Information Technology Course in Senior High School Based on Project-based Learning

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Abstract: Organizing teaching activities with project-based learning strategy can give full play to students' initiative and cultivate their independent inquiry ability, which is of great significance to the cultivation of innovative talents. Aiming at the problems of classroom silence, insufficient learning motivation and poor self-efficacy, which are easy to appear in the traditional teaching process of information technology, based on the paradigm of empirical research, this study explores the effective way of organizing project-based learning in high school information technology curriculum, and focuses on the project-oriented task design strategy. The study selected three classes from senior one of a high school to carry out the experiment. Among them, class 12 of senior one is used as the experimental class and classes 13 and 14 of senior one are used as the control class. On the basis of the traditional teaching of combining teaching with practice, the task driven method is used to carry out the teaching. It emphasizes the project selection and task decomposition strategy facing the teaching objectives, constructs a progressive learning and practice situation for students through a series of case-based and systematic tasks, and organizes teaching practice activities based on these tasks. On the basis of a series of teaching practice activities, through the data of academic achievement, learning interest and attitude and sense of self-efficacy, this study demonstrates that project-based learning which is based on task-driven method can indeed encourage students to better participate in learning activities, has obvious effects on the improvement of work quality and learning achievement, and can improve students' learning interest and sense of self-efficacy.

Keywords: Project-based Learning, Task-driven Method, Information Technology Course Teaching

1. Introduction

1.1. Research Background

1.1.1. The Traditional Teaching Model of Speaking-demonstration Is Not Conducive to the Cultivation of Innovative Talents

With the rapid development of information technology, diversified talents with learning ability and innovative spirit are paid more and more attention. Promoting students' subject participation and cultivating students' subject consciousness in education and teaching is of great significance to students' self-development and adaption to the society. This idea is also reflected in the requirements of the new curriculum reform. However, the traditional speaking-demonstration teaching is the teacher-centered, which ignores the subjectivity of students, and even deprives students of the opportunity of autonomous learning and exploration, which seriously affects the implementation of the national talent training strategy.

In the teaching of information technology course, some teachers still adopt the traditional speaking-demonstration teaching model. On the one hand, this model is contrary to the concept of "learning by doing" and "learning by using" in information technology course, which is difficult to give full play to students' subjectivity and easy to produce silence in

classroom. On the other hand, it is more difficult to meet the needs of training innovative talent, which shackles the development of students' thinking ability, innovation ability and cooperation ability [14].

1.1.2. The Characteristics of Information Technology Course Are Suitable for Project-based Learning and Group Cooperation

Information technology courses in primary and secondary schools are highly practical and procedural, which is convenient for organizing project-based learning aimed at work design. The characteristic that information technology course is easy to stimulate students' interest, makes it easy to achieve teaching objectives through the concept of learning by doing and learning by using. Project-based learning and group cooperation based on work design are of great significance to enhance students' learning interest and sense of self-efficacy and cultivate students' cooperation ability and time management ability.

Under the background of the information age, the level of information technology has become an important standard to measure talents. The new curriculum reform started around 2000 takes cultivating students' information technology literacy as the core task of primary and secondary school information technology course. Therefore, information technology course in primary and secondary school has become an important base for the cultivation of information technology skills and the development of students' core literacy. Many educators are constantly exploring new teaching models and methods to achieve this goal.

Based on the strategic requirements of talent training, the characteristics and teaching objectives of information technology course, for the purpose of cultivating students' core literacy, this study explores the design and effectiveness of teaching activities of information technology course in high schools based on project-based learning and task-driven from three aspects, which are information technology knowledge and skills, learning interest and self-efficacy.

1.2. Research Questions

This study assumes that the teaching model based on project-based learning can effectively improve students' information technology knowledge and skills, and have a positive effect on the development of students' learning interest, self-efficacy and independent inquiry ability. Based on this, this study mainly focuses on the following three key issues.

(1) Based on the teaching objectives of information technology course and students' learning situation, how to design effective projects? How to realize project-oriented task decomposition and transform the project into several sub tasks that are easy to operate?

(2) The project-based learning at the macro level should be based on the task-driven method and group cooperation at the meso level, then how to do a good job in the teaching design under the guidance of the task-driven concept?

(3) How to evaluate the effect of project-based learning? How to verify the effectiveness of strategies and methods from the three dimensions of academic achievement, interest and attitude, and self-efficacy?

2. Literature Review

Project-based learning is a macro teaching model. In the specific implementation, we must organize teaching activities with the help of meso task-driven or problem-solving strategies, and the operation of the project is usually realized in the way of group cooperation. In project-based learning, the project is the core, and the whole learning process should run around the project. The implementation of a project is usually not to complete an isolated single task, but an organic combination of several subtasks. The process of project-based learning is a process in which task-driven strategy is used to encourage students to cooperate to complete the project as a unit, and the improvement of knowledge, skills and attitude is realized in this process [1]. Therefore, this paper will review the literature from two aspects, which are Project-based Learning and task-driven strategy.

2.1. Project-based Learning and Its Implementation

Project-based learning emphasizes student-centered and group cooperative learning, and requires students to explore real problems in real life, so that students can get improved in the process of project implementation [11].

2.1.1. Characteristics of Project-based Learning

Project-based Learning is a teaching model that imitates the product manufacturing process of the factory or studio. Products are made by several people's cooperation and then learning is realized in the product process. Since the whole learning process is carried out around the project, the selection of the project is very important. It should not only cover the teaching objectives, but also match the learners' age characteristics and psychological representation.

The difficulty of the project should be moderate. The project should usually include several hierarchical and progressive subtasks to promote students' learning from shallow to deep, from here to there, and then realize the migrate, association and epiphany from one knowledge point to another [12].

Project-based learning is usually organized as a group. Through group cooperation, they jointly complete a comprehensive product or work, so as to promote team members to achieve common progress in the process of product development.

2.1.2. Implementation Steps of Project-based Learning

Project-based learning is divided into five basic steps, which are selecting a project, making plans, activity exploration, making works, communicating and evaluating.

(1) Selecting a project. The selection of projects is very important and should meet the requirements of students' age characteristics, learning level and teaching objectives [2]. The scope of the project should be

appointed by teachers, or the project should be designated directly by teachers to give full play to teachers' leadership. The project should cover the knowledge points specified by the teaching objectives. The project should match the psychological characteristics of students. The selected project should be able to resonate with students as much as possible.

(2) Making plans. The plan includes time arrangement and activity arrangement, etc. Time arrangement is a detailed time plan for students to carry out project-based learning, when to do what, how long to do, etc. Activity arrangement refers to the activities to be done to complete the project, such as questionnaire survey, interview, etc.

(3) Activity exploration. This link is the main body of project-based learning. Students' acquisition of most knowledge, mastery of skills and cultivation of ability are realized in this link. Activity exploration is the stage in which each group explores according to the plan and project objectives. Teachers at this stage mainly provide guidance and answer questions for students.

(4) Making works. After completing the preliminary work, all the materials should be summarized and the works should be realized according to the objectives of the project. Making works is to turn the preliminary work into achievements. During the production, each team can divide the work after discussing the work design.

(5) Communicating and evaluating. After making project works, teachers should organize students to display the works of each group and let each group express their feelings on project-based learning. The evaluation includes formative evaluation and summative evaluation. The evaluation content is rich and diverse, including project selection, students' performance in group cooperation and so on. There are many forms of evaluation, including individual evaluation, group evaluation, self-evaluation, mutual evaluation, etc.

2.2. Task-driven Concept and Strategy

2.2.1. Meaning of Task-driven Strategy

Task-driven method refers to that students complete tasks under the guidance of teachers, around specific task scenarios, through independent exploration and collaborative learning, and with the help of materials provided by teachers, so as to achieve the purpose of mastering knowledge, acquiring skills and improving ability. Its fundamental feature is taking the task as the main line, teachers as the leading and students as the main body [3].

2.2.2. Principles of Task Design

In project-based learning, task design is the core step. For task design, the following principles need to be met:

Practical principle. Information technology course pays attention to practice and requires students to learn both theoretical knowledge and practical operation skills. Therefore, the teaching method of unilateral indoctrination by teachers and passive acceptance by students should not be adopted, but hands-on training on the computer.

Objective principle. The task itself is not a teaching goal, but a teaching means. Students complete the task, so as to achieve the teaching goal. Don't deviate from the goal by pursuing the perfection of the task.

Interest principle. When designing tasks, we should combine students' interests and real life, which is not only conducive to students' understanding, but also attract students.

Hierarchy principle. Different students have different theoretical level and practical ability. When designing tasks, the situation of different students should be considered and stratified teaching should be adopted.

Evaluability principle. If the results of the task can't evaluate whether the teaching goals are achieved, then the learning effect of students can't be known.

2.2.3. Task Decomposition for the Project

(1) Principles of task decomposition

In project-based learning, the project usually consists of multiple subtasks which are easy to operate. High-quality task decomposition is the necessary basis of project-based learning [4]. Teachers and students can express knowledge points in teaching in the form of mind map. Generally speaking, the decomposition of tasks should be in a certain order, from easy to difficult, from simple to complex, so as to meet the needs of students with different ability levels. The decomposed subtasks should be interrelated and influence each other, not independent, and they must be an organic whole. Each subtask shall be operable and of moderate size. The design of subtasks should be hierarchical, and the difficulty should be from easy to hard. The previous tasks have an enlightening effect on the later tasks, from small tasks facing knowledge points to large tasks facing comprehensive application, which are progressive and linked. The design of subtasks should be based on the tasks facing knowledge points and take the tasks facing comprehensive application as the core.

(2) Method of task decomposition

Task decomposition can be done with the help of work breakdown structure (WBS) in project management. Its main idea is to subdivide a large project into several small projects convenient for management. The coverage of the large project must be determined, that is, all elements of the work need to be understood [5]. WBS carries out systematic, interrelated and coordinated hierarchical decomposition according to the laws and principles of project development. The lower the level, the finer the decomposed work elements. And finally a hierarchical decomposition structure diagram is formed. The teaching objectives of information technology course are also quite a large project. The large teaching objectives are decomposed into small teaching objectives through WBS. Teachers finally complete the large teaching objectives through the realization of each small objective. Therefore, this study takes the WBS of project management as the method of subdividing teaching tasks. WBS decomposes work tasks through graphic display and sawtooth list. As shown in Figure 1.

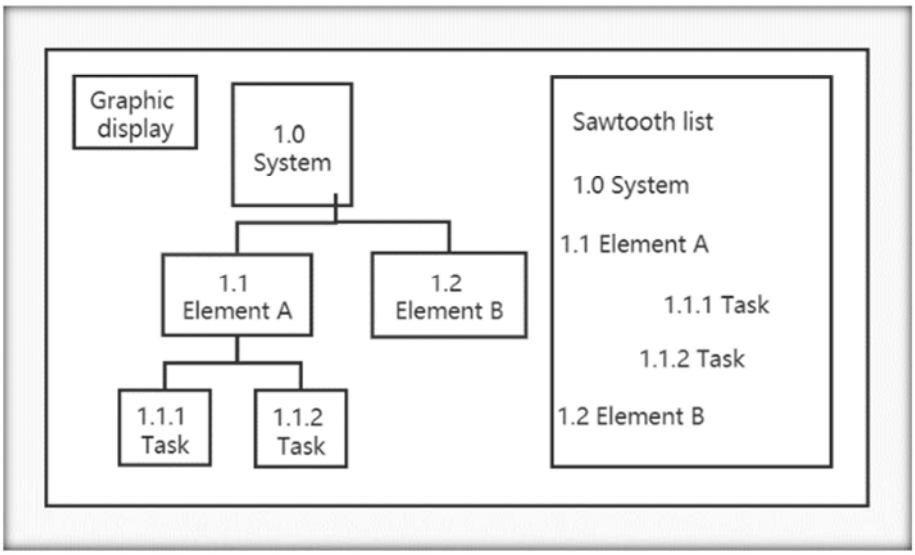

Figure 1. *Two expressions of WBS.*

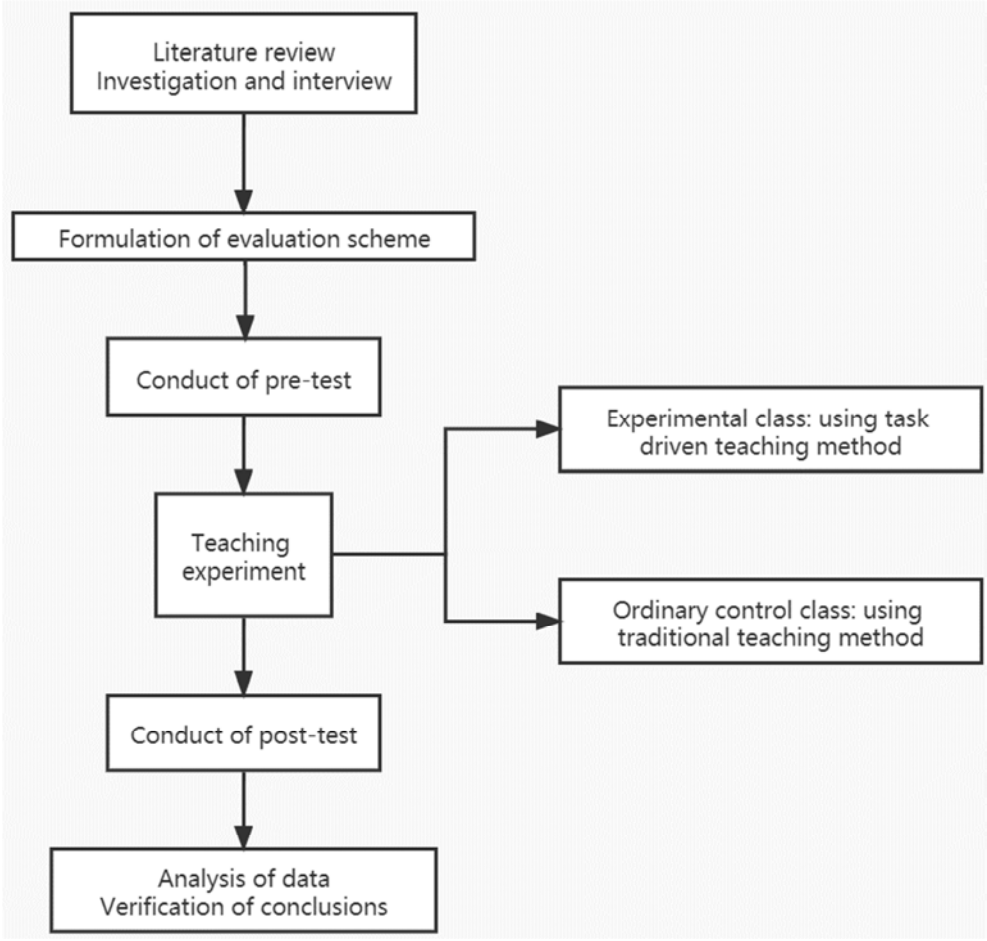

Figure 2. *Design of research process.*

2.2.4. Effective Strategies of Task-driven Teaching

Since the introduction of task-driven teaching method into China, many scholars and teachers have explored its application and put forward practical strategies.

Zhao chengling and others conducted research on the teaching design of modern educational technology experimental course based on task-driven method, presented the strategy of using task-driven method, emphasized the value of task type, and set closed, semi closed, open types of sub tasks. Through broadcast sharing, inter group evaluation and competition, learners' learning interest and motivation were stimulated and the expected teaching objectives were

achieved [6].

Li Xiuming and others have designed the teaching of information technology courses in primary and secondary schools based on the task-driven method. They take the theme poster in line with students' age characteristics and psychological representation as the task to stimulate each learner's creation and learning motivation. Teachers guide learners through on-site questioning, patrol and other strategies to solve problems in time in the process of task realization [7].

3. Research Design

3.1. Research Process Design

The goal of this study was to explore an interrelated, hierarchical and progressive task system composed of several sub tasks, reflect the relationship between knowledge points, and guide students to learn from one to another. In the teaching process, students achieved the breakthrough of knowledge points by completing each small task assigned by teachers, so as to achieve the purpose of learning goals.

The author believes that teachers should regard the teaching content as a general teaching goal. In project selection and task design, with the help of the strategy of task decomposition, the general teaching goal should be divided into several small goals, that is, the big task should be divided into several related small tasks, so as to promote students to complete the learning by completing each small task. The process of the whole study is shown in Figure 2.

3.2. Research Methods

(1) Quasi experimental research method

Quasi experimental research method is a research method of psychology, which is now widely used in the field of educational technology. It emphasizes that the subjects need not be randomly arranged, so that the subjects can get the experimental treatment under a more natural situation. Therefore, the method of quasi experimental research design is similar to that of real experiment in many aspects. This study adopted the unequal control group in the quasi experimental research method to carry out the experiment, and the data from the experiment were analyzed to test the teaching effect.

(2) Questionnaire survey method

Through the questionnaire survey method, the contents that students were interested in were understood, feedbacks on the teaching effect were collected, the teaching methods were timely improved and the teaching quality was enhanced. The implementation object of this study was the selected experimental class (the class carrying out task-driven teaching), which answered anonymously and took it back in time after distribution.

(3) Interview and observation

Through observation, it could be known whether students adapt to task-driven teaching, the problems existing in the teaching process could be found out and adjustments could be made in time. Through interviews, students' psychological feelings could be understood, whether the current task-driven teaching needs to be improved could be explored, and reference for task design and organization in teaching activities could be provided.

3.3. Teaching Evaluation Tools

This study intended to verify the effectiveness of task design strategies and methods from three aspects: academic achievement, learning interest and attitude and self-efficacy. Academic achievement was measured by final examination scores and students' works, learning interest and attitude were measured by the questionnaire of information technology learning interest and attitude designed by the author, and self-efficacy was measured by General Self-Efficacy Scale (GSES).

The questionnaire of information technology learning interest and attitude designed by the author referred to the ARCS interest questionnaire by Guo Dejun and others, and was reviewed by three middle school information technology teachers with senior professional titles [8]. It was considered that the questionnaire had high reliability and validity.

In addition, in this study, the author also designed several evaluation forms to evaluate students' learning, which reflected the diversified idea of the evaluation scheme under the new curriculum standard. Through these evaluation forms, the situation of students completing tasks and achieving goals in the classroom was well fed back. For example, the evaluation between groups promoted the competition among students, and the learning efficiency was naturally improved Therefore. Teachers' fair and impartial evaluation of students could encourage students to work hard, make them experience the joy of success and find their own shortcomings. This evaluation model could also provide reference for the comprehensive evaluation of the final term.

4. Process of the Teaching Practice

For the teaching activities organized in the project-based learning model, there are five rounds in this semester, that is, five learning projects are organized in one semester, and students are required to complete the teaching objectives driven by these five projects. This paper only takes the operation of image synthesis project as an example to briefly explain the design and operation process of learning activities.

4.1. Analysis of the Students

(1) Students' knowledge and skills

The teaching object of this course was senior one students. Students were very interested in the image processing function of Photoshop software and had a strong desire to learn. Before that, students had learned the basic use of Photoshop tools, such as selection tools, mobile tools, free transformation, text input and other basic knowledge. They could carry out some simple processing of pictures, such as picking out the required parts in a picture by selecting tools. The difficulty in the teaching process was to teach students how to use the

knowledge of layers and masks to synthesize and modify pictures. Through the study of this class, students could master how to integrate the extracted parts into another picture, so that students could make picture works that could express certain themes and ideas, so as to improve students' technical level, develop their innovative thinking.

(2) Students' attitude and emotion

For the content of Photoshop module, many students had not yet realized the entirety and integrity of the course content. They believed that this was a "play" course, and there were some deficiencies in learning attitude and preciseness. For these problems, teachers should give some correction and guidance in time, but pay attention not to be too blunt and hurt students' self-esteem. They should explain patiently to keep their learning enthusiasm, so that students can gradually realize that the ultimate goal of "learning by playing" and "learning by doing" is "learning" rather than "playing".

4.2. Design of Image synthesis Project

4.2.1. Selecting Executable Projects

(1) Project requirements

The National Day is coming. Please make a poster in groups to celebrate the national day with the materials provided by the teacher: five-pointed star, national flag, flower basket, Tiananmen tower, Monument to the People's Heroes, Mount Tai, Yellow River and so on.

(2) Design intent

National Day is an important festival in China. Students are familiar with national day and its related elements, which is helpful to contact real life, find creative inspiration and design, stimulate students' learning motivation and cultivate students' patriotic feelings.

The content of poster design project was relatively complex, which could cover the key knowledge points of image processing in Photoshop, but they were still in the zone of proximal development of students, which was conducive to the application of students' knowledge and promoted the students' development to the greatest extent.

4.2.2. Teaching Goal Design

This course focused on the design of tasks around the basic methods of image synthesis, mainly including the following knowledge points: matting, moving, adjusting, beautifying and decorating. After task decomposition, the results are shown in Figure 3.

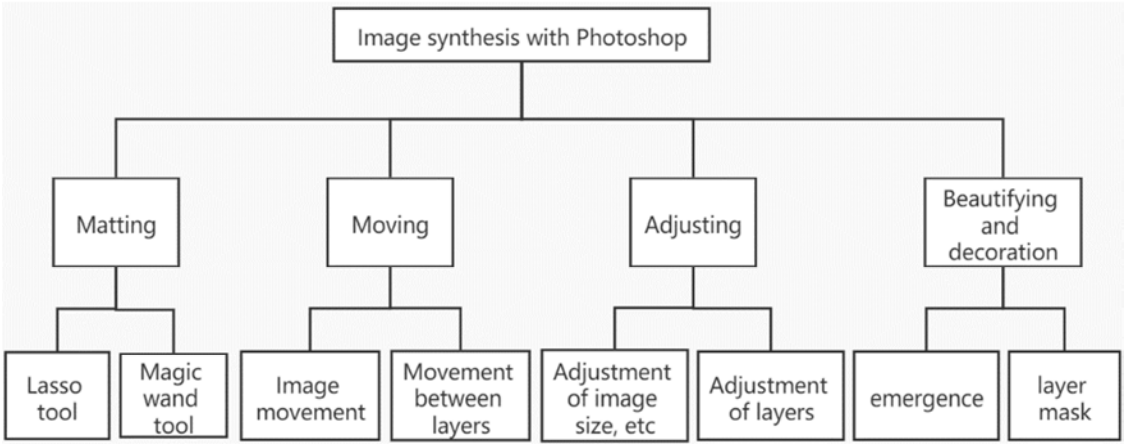

Figure 3. *Task design decomposition of Image synthesis with Photoshop.*

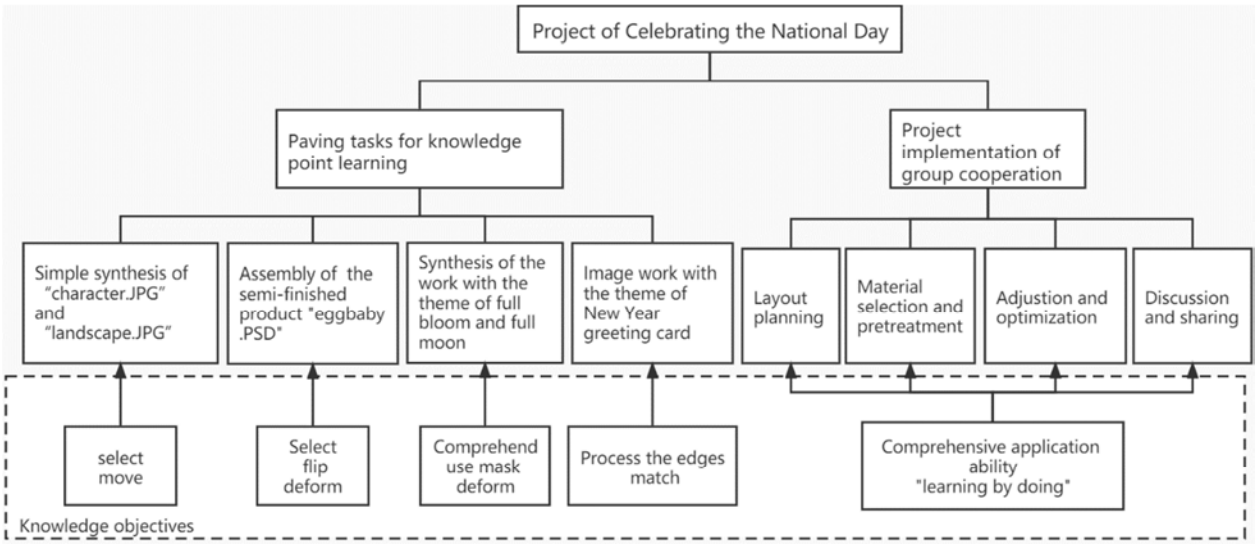

Figure 4. *Task system of Celebrating the National Day.*

4.2.3. Task Decomposition and Systematization

This project was a relatively complex image synthesis and production project, which was decomposed according to the WBS task decomposition theory in project management, and took into account the paving tasks for knowledge point learning and the final goal tasks for comprehensive application. In the process of task design and decomposition, we should fully consider the students' proximity to the development area and pay attention to the progressiveness and hierarchy between sub tasks. The final task system can be presented by WBS graphically. The practice process of the task system of the project Celebrating the National Day is shown in Figure 4.

4.2.4. Case Presentation of Subtasks

According to the teaching goal decomposition and task design of image synthesis module in Photoshop, a series of sub tasks were formed. The specific subtasks for knowledge points are shown in Table 1.

Table 1. *Specific subtasks for knowledge points.*

Task number	Content	Design intent
1	Open the task 1 folder under the D disk of the student computer, simply synthesize the two pictures provided by the teacher, pull out the image of "character.JPG" and move it to "landscape.JPG", and save it in the format of "character and landscape.PSD".	According to the students' existing knowledge level, students are required to complete the synthesis of a simple image work. The picture is not required to be beautiful. It can not only review the knowledge just learned, but also prepare for learning new content next.
2	Open the PS semi-finished product "Egg baby.PSD" provided by the teacher in task 2 folder under the D disk, and put together the images in the file to make it a lovely egg baby. Students who do not understand can refer to the auxiliary teaching video or ask the teacher.	The students have easily completed task 1 and realized that the software function is powerful and magical, so their learning enthusiasm is higher. In the last lesson, the teacher has made a brief introduction to the concept of layer and the transparency of layer, but the students still feel more abstract, so they have to further learn the knowledge of layer through specific operations. Through task 2, students can practice changing the order of layers, copying and flipping layers. Task 2 is more difficult than task 1. It is an advanced task. Students should explore and operate independently. Through this assembly exercise, students deepen their understanding and application of layers and pave the way for the next image synthesis.
3	Open the four picture materials (background picture, flower picture, fairy picture and rabbit picture) with the theme of full bloom and full moon provided by the teacher in task 3 folder under disk D, combine the four pictures into one picture, highlight the theme clearly, integrate the images perfectly, and show the theme through text tools.	The difficulty of image synthesis is the operation of layers, and the knowledge involved is relatively broad and abstract. Beautifying and decorating the image through layer mask is a knowledge point that is easy to use and difficult to learn. Through task 3, students can practice modifying and beautifying the edge of the image through layer mask and feathering, so as to make the synthesis of the image more realistic. Task 3 is more difficult than task 1 and task 2. Students are required to cut, move, deform, beautify and modify, add words and other operations. The tasks are closely linked and the gradient is obvious, which provides opportunities for some students with good foundation. Students with poor ability can complete this task with the help of other students or teachers.
4	Open the task 4 folder under disk D, take the group as the unit, give play to the imagination and spirit of unity and cooperation, download picture materials from the Internet, and design a New Year greeting card, which requires the synthesis of at least four images. The theme of the work should be healthy, and the transition between pictures should be natural. After completion, save it in PSD format, and upload the work to the teacher's computer in groups.	Task 4 is not only an expanding task of this lesson, but also a comprehensive application of the knowledge of this lesson. It covers the knowledge points from task 1 to task 3. Students are required to determine the theme work in groups, which greatly develops the students' innovative thinking, so that students can apply what they have learned after completing task 1 to task 3, and improve their cooperation spirit and technical level. Through this comprehensive task, the technical ability of students with different knowledge levels can be improved, and the teaching objectives of teachers can be successfully completed.
Integrated task	Form a study group of 3-4 people, take the group as the unit, use the materials provided by the teachers, freely choose the content of the materials, and create a poster of Celebrating the National Day.	Students can comprehensively apply the skills they have learned to complete the creation of comprehensive works.

4.3. Teaching Practice

4.3.1. Process of Teaching Practice

(1) Selection of research objects

This study was carried out in A middle school in Guangdong Province from 2016 to 2018. The teaching material used was Application of Multimedia Technology published by Guangdong Education Press. The students of A middle school came from all villages and towns in the county, and their information technology level was mixed. Nearly one-third of the students had not learned some basic computer operations before.

(2) Control of research process

The subjects of this study were class 12 (61 students), class 13 (64 students) and class 14 (59 students). Among them, class 12 was the experimental class and the researchers used the task-driven method for teaching. Classes 13 and 14 were the ordinary control classes, and the researchers used the traditional method of combining teaching with practice. This setting was to shield the interference of non-research factors such as teaching venues and teaching periods, so as to obtain more objective and effective research conclusions.

In this study, the teaching design was based on the actual teaching content, and the task-driven method was used to teach the experimental class. The ordinary control classes still carried out teaching according to the traditional method. In order to avoid the influence of irrelevant factors or variables, the teaching progress, amount of homework, practical questions and inquiry questions of the two classes were the same.

Using the questionnaire of students' information technology level, the questionnaire of information technology learning interest and attitude and General Self-Efficacy Scale, the pre-test was carried out for the experimental class and the ordinary control classes. On the one hand, it was to compare with the post-test data, on the other hand, it was to understand the situation of students through the questionnaire. The t-test of two independent samples was carried out on the pre-test data by spss24.0. The results showed that there was no significant difference between the experimental class and the ordinary control classes in the above dimensions.

4.3.2. Data Acquisition

Based on the evaluation strategy in the research design, the data collection of this study mainly included three aspects: (1) the work quality and final examination results of the course, which were used to investigate whether the students' information technology level was improved; (2) questionnaire survey on students' learning interest and attitude which was used to investigate whether students' learning interest and attitude had been improved; (3) data obtained from General Self-efficacy Scale.

The questionnaire survey was mainly arranged at the beginning and end of the semester as pre-test and post-test respectively for subsequent evaluation and analysis. Because the questionnaire adopted full positive narrative questions, the higher the score, the higher the students' interest in the subject.

5. Research Results

For the effectiveness of teaching practice, it will be measured from the aspects of task-driven work quality, academic achievement and questionnaire conclusion, so as to evaluate it as comprehensively as possible.

5.1. Evaluation for Work Completion in Project

The quality of works directly reflects the ability of students to solve practical problems by using their knowledge, and is the core index affecting the quality of project learning. During the generation of works of the Celebrating National Day project, all students evaluate themselves and their classmates through the Work Evaluation Form. The evaluation results of some collaborative groups are shown in Table 2, table 3, table 4 and table 5.

5.1.1. Analysis of the Work Quality

The self-evaluation, mutual evaluation and teacher's evaluation for work quality of team 2 are shown in Table 2. It can be seen from table 2 that generally students could use the knowledge points taught by teachers to create, and had the ability of objective self- and mutual evaluation. Students' self-evaluation scores were slightly higher than those of mutual evaluation and teacher's evaluation, which showed that students were more confident in their completed works, and reflected their high level of self-efficacy to a certain extent.

Table 2. *Evaluation form of Celebrating the National Day works (group 2).*

Evaluation content	Self-evaluation	Mutual evaluation	Teacher's evaluation
The content expressed in the work is healthy and positive. (20 points)	15	12	14
The appropriate tool is selected for simple image synthesis. (50 points)	37	33	36
The colour collocation of the work is reasonable, the picture size is appropriate, and the overall feeling is good. (15 points)	11	12	11
The work has personality and innovation. (15 points)	14	12	13
Total score of each item	77	69	74
Average score (three items)	72.3		

Successful reflection is helpful for students to cultivate self-confidence, improve self-efficacy and enhance learning motivation. Reflection on improvement is helpful for students to correct their learning behavior, so as to improve learning efficiency and ability. Table 3 presents the self-reflection and self-evaluation of the case Huang Xiaolei on the learning process. As can be seen from table 3, Huang Xiaolei scored high in all aspects and showed good confidence. At the same time, she also realized that her spirit of active exploration was not enough and her ability to actively ask questions needed to be strengthened. This understanding was undoubtedly of great significance for her subsequent progress.

Table 3. *Self-reflection and evaluation form of learning process.*

Name: Huang Xiaolei	Score	Successful place	Areas for improvement
Task completion (20%)	18		
Whether the learning attitude is active and has the spirit of exploration (20%)	17		The spirit of exploration is not enough
Can the task be completed through problem solving	16	Asking questions actively	To be strengthened
Autonomous Learning (20%)	18	Better	Row4
Row5 Capacity of division of labour and cooperation (20%)	18		Row5
Total score	87		Row7

5.1.2. Analysis of Group Cooperation Level and Quality

Group cooperation is an important part of project-based learning. The level and quality of cooperation among group members are directly related to the success or failure of project-based learning. Therefore, the evaluation of group cooperation level and cooperation quality is also an important aspect of project-based learning evaluation. The intra group mutual evaluation data of group 2 are shown in Table 4.

Table 4. *Mutual evaluation form within student group.*

Evaluated by: Huang Xiaolei	**Member name**		
Collaborative activities: synthesis and creation of Celebrating the National Day	**Wen Lili**	**Zeng Kai**	**Zhang Hankun**
Was willing to cooperate with other students (25 points)	23	22	20
Completed the assigned tasks in the group by yourself (15 points)	14	13	14
Was able to find problems outside the task in the creative process (20 points)	16	17	14
Was able to accept the suggestions of other members (10 points)	8	7	8
Was able to complete the task on time (15 points)	12	13	13
Showed your ability in the group as much as possible (15 points)	11	10	11
Total score	84	82	80

The data in Table 4 showed that the collaboration scores (mutual evaluation) of team members were generally high, indicating that generally each member could actively participate in the task completion process and cooperate well with others. In addition, the gap between the scores of different members was not very large, which helped poor students cultivate self-confidence and narrowed the gap between students.

All team members had experience in finding problems, solving problems, collaboration and communication, and scored high in each indicator dimension. This was consistent with the self-assessment conclusion of the team members and could be confirmed by each other.

The self-evaluation data of the case Huang Xiaolei are shown in Table 5. Through its self-evaluation data, it could be seen that the student had a high self-evaluation on various dimensions, thought she had a good performance in completing all links of the task, and had a strong ability to find problems, solve problems and communicate, which helped her cultivate self-confidence, improve self-efficacy, and enhance interest in learning information technology.

Table 5. *Student self-evaluation form.*

Name: Huang Xiaolei	
Evaluation items (total score: 100)	**score**
I can actively cooperate with other students (10%)	9
I can consciously participate in collaborative learning (8%)	8
I can understand my responsibilities in the process of work creation (8%)	6
I can identify and ask questions in collaboration (15%)	13
I can propose some solutions in collaboration (15%)	12
I can accept the opinions of other students (10%)	10
I can help other members (8%)	6
I can reach my full potential (10%)	8
I can complete the assigned tasks through problem solving (16%)	16
Average score	87

5.2. Analysis of Academic Achievement and Questionnaire Survey

5.2.1. Analysis of Students' Academic Achievement in Information Technology Course

In order to test students' mastery of information technology knowledge and skills, this study analyzed the final examination scores of the two types of classes. The independent sample t-test was carried out with the help of spss24.0, and the results are shown in Table 6.

Table 6. *Independent sample t-test results of final grades of experimental class and control classes.*

Contrast pair	**Experimental class**		**Ordinary control class**		**T**	**Sig**
	Mean	**Standard deviation**	**Mean**	**Standard deviation**		
Experimental class-ordinary control class 1	92.6	23.21	84.3	24.22	2.926	0.000**
Experimental class-ordinary control class 2	92.6	23.21	85.1	26.27	2.821	0.000**

According to table 6, the sig values of "experimental class-ordinary control class 1" and "experimental class-ordinary control class 2" t-tests were less than 0.05, indicating that there was a significant difference between the final grade of the experimental class and the two ordinary control classes. The average of the final grade of the experimental class was 92.6, and the average of the two ordinary control classes were 84.3 and 85.1 respectively. The average of the two ordinary control classes was similar, indicating that the students' academic level was roughly the same. Compared with the ordinary control classes, the performance of the experimental class had improved significantly, which showed that the teaching based on task-driven method greatly improved the students'

performance. Secondly, the standard deviation of the results of the experimental class was 23.21, and the standard deviations of the two ordinary control classes were 24.22 and 26.27 respectively. The standard deviation of the experimental class was less than the standard deviation of the ordinary control class, that is, the distribution of the results of the students in the experimental class was relatively concentrated, and the distribution of the results of the students in the ordinary control classes was relatively scattered, indicating that the task-driven teaching promoted the learning of students at different levels and narrowed the gap between students.

5.2.2. Analysis of Students' Learning Interest and Attitude in Information Technology Course

The existing scale was used to measure the learning interest and attitude of students in experimental class and ordinary control classes. The data results are shown in Table 7.

Table 7. *Independent sample t-test results of learning interest and attitude between experimental class and control classes.*

Contrast pair	Experimental class		Ordinary control class		T	Sig
	Mean	Standard deviation	Mean	Standard deviation		
Experimental class-ordinary control class 1	58.81	12.23	32.05	10.27	18.315	0.000**
Experimental class-ordinary control class 2	58.81	12.23	30.27	11.19	19.123	0.000**

According to table 7, the sig values of t-tests of "experimental class-ordinary control class 1" and "experimental class-ordinary control class 2" were less than 0.05, indicating that there was a significant difference between the students' learning interest in the experimental class and the two ordinary control classes. The average value of the experimental class was 58.81, and the average values of the two ordinary control classes were 32.05 and 30.27 respectively. The average values of the two ordinary control classes were similar, indicating that the students' learning interest was roughly the same. Compared with the ordinary control classes, the students' interest in learning information technology in the experimental class was greatly improved, which showed that the teaching based on task-driven method greatly stimulated the students' interest in learning, which had obvious advantages over the traditional teaching.

Table 8. *Paired sample t-test results of pre-test and post-test data of learning interest in experimental class.*

Contrast pair	Pre-test		Post-test		T	Sig
	Mean	Standard deviation	Mean	Standard deviation		
Pre- and post-test data of experimental class	30.21	11.37	58.81	12.23	27.213	0.000**

According to table 8, the sig value of the t-test of the pre-test and post-test of the experimental class was less than 0.05, indicating that there was a significant difference between the post-test and pre-test of learning interest in the experimental class. The average value of the post-test in the experimental class was 58.81 and the average value of the pre-test in the experimental class was 30.21. Compared with the pre-test, the post-test had greatly improved students' interest in learning information technology, It showed that the teaching based on task-driven method greatly stimulated students' interest in information technology.

Table 9. *Paired sample t-test results of pre-test and post-test data of learning interest in ordinary control classes.*

Contrast pair	Pre-test		Post-test		T	Sig
	Mean	Standard deviation	Mean	Standard deviation		
Pre- and post-test data of ordinary control class	30.21	13.23	32.05	10.27	0.928	0.475

According to table 9, the sig value of t-test of the pre-test and post-test in the ordinary control classes was greater than 0.05, indicating that there was no significant difference between the post-test and the pre-test. The average value of the post-test of the ordinary control class was 32.05 and the average value of the pre-test of the ordinary control class was 30.21. Compared with the pre-test, the post-test had only slightly improved the learning interest, indicating that the traditional teaching method was difficult to stimulate students' interest in information technology.

According to table 8 and table 9, the mean value of the pre-test of the experimental class and the ordinary control class was 30.21, while the standard deviation was 11.37 and 13.23 respectively. There was little difference in the standard deviation. Therefore, it could be explained that the initial learning interest and attitude level of the students in the experimental class and the ordinary control classes were roughly the same, and that the gap between the post-test of the two classes was caused by the teaching method.

5.2.3. Analysis of Students' Self-efficacy in Information Technology Course

Self-efficacy is an important factor to measure students' self-confidence and promote the development of students' independent inquiry ability and innovation ability. Using General Self-Efficacy Scale (GSES), the self-efficacy level of students in the two types of classes was measured before and after the teaching practice, and the data were analyzed. The results are shown in table 10, table 11 and table 12.

Table 10. *Paired sample t-test results of pre-test and post-test data of learning interest in ordinary control classes.*

Contrast pair	Pre-test		Post-test		T	Sig
	Mean	Standard deviation	Mean	Standard deviation		
Pre- and post-test data of ordinary control class	30.21	13.23	32.05	10.27	0.928	0.475

According to table 10, the sig values of t-tests of "experimental class-ordinary control class 1" and "experimental class-ordinary control class 2" were less than 0.05, indicating that there was a significant difference between the students' self-efficacy of the experimental class and the two ordinary control classes. The average value of the experimental class was 4.37, and the average values of the two ordinary control classes were 3.72 and 3.67 respectively. The average values of the two ordinary control classes were similar, indicating that the students' self-efficacy level was roughly the same. Compared with the ordinary control classes, the students' sense of self-efficacy in the experimental class was greatly enhanced, which showed that the teaching based on task-driven method could enhance the students' sense of self-efficacy, which had obvious advantages over the traditional teaching.

Table 11. *Paired sample t-test results of pre-test and post-test data of self-efficacy in the experimental class.*

Contrast pair	Pre-test		Post-test		T	Sig
	Mean	Standard deviation	Mean	Standard deviation		
Pre- and post-test data of experimental class	3.512	1.725	3.705	1.379	0.836	0.578

According to table 11, the sig value of t-tests of the pre-test and post-test in the experimental class was less than 0.05, indicating that there was a significant difference between the pre-test and post-test of students' self-efficacy in the experimental class. The mean value of the post-test was 4.37 while the mean value of the pre-test was 3.51. Compared with the pre-test, students' self-efficacy was greatly enhanced, indicating that teaching based on task-driven method could enhance students' self-efficacy.

Table 12. *Paired sample t-test results of pre-test and post-test data of self-efficacy in the experimental class.*

Contrast pair	Pre-test		Post-test		T	Sig
	Mean	Standard deviation	Mean	Standard deviation		
Pre- and post-test data of experimental class	3.512	1.725	3.705	1.379	0.836	0.578

According to table 12, the sig value of the pre-test and post-test t-tests in the ordinary control classes was 0.578, which was greater than 0.05, indicating that there was no significant difference between the pre-test and post-test. The mean value of the post-test was 3.705 while the mean value of the pre-test was 3.512. Compared with the pre-test, the post-test had slightly improved but not significantly. It showed that the effect of traditional teaching method on enhancing students' self-efficacy was not obvious, and it had no advantage over task-driven teaching.

According to table 11 and table 12, the mean values of the pre-test of the experimental class and the ordinary control classes were both 3.51, while the standard deviation was 1.037 and 1.725 respectively. There was little difference in the standard deviation. Therefore, it could be explained that the initial self-efficacy level of the students in the experimental class and the ordinary control classes was roughly the same, and that the post-test gap between the two types of classes was caused by the teaching method.

Based on the above analysis, it could be found that the academic level of the two ordinary control classes receiving traditional teaching was roughly the same, which was significantly lower than that of the experimental class receiving task-driven teaching. The initial level of learning interest, attitude and self-efficacy of the experimental class and the ordinary control classes was roughly the same, but after the teaching experiment, the level of the two ordinary control classes was still roughly the same, but significantly lower than that of the experimental class. Therefore, the data showed that task-driven teaching method effectively improved the level of academic achievement, learning interest and attitude, self-efficacy and so on.

5.3. Discussion

5.3.1. Conclusion of the Teaching Practice

(1) Task-driven method could indeed improve students' academic achievement, learning interest and self-efficacy

The test results of academic achievement, learning interest and attitude and self-efficacy showed that the implementation of task-driven teaching in information technology in senior high school was more effective than traditional teaching, and students gradually liked and recognized this teaching method. In the practice of task-driven teaching, the teaching effect was significantly improved through the careful design of tasks and the guidance and help given to students.

First of all, most students were serious, explored and studied independently, and the tasks assigned by teachers was completed actively. In the process of learning, students not only learned new knowledge, but also cultivated their autonomous learning ability. Secondly, the main idea of task-driven teaching was "taking students as the main body". Students were the main body of learning, and teachers played the role of guide, organizer and promoter in teaching. Through the completion of the task, students experienced the joy of success, which greatly improved students' learning motivation, enabled students to actively cooperate with

teachers' teaching, and the teaching effect was significantly improved.

At present, part of the teaching researches based on task-driven method are not systematic in the verification of the effectiveness of it. In addition to academic achievements, they also rely on some piecemeal problems, such as "the degree of interest in the learning model", but the verification through these problems is not necessarily reliable. This study used questionnaires and scales with high reliability and validity to verify the effectiveness of task-driven method, and the verification results were reliable. Some similar studies have also proved that the implementation of task-driven teaching in information technology course can enhance students' learning interest, promote collaborative learning and enhance students' motivation, which is mutually confirmed with the conclusions of this study [9, 13, 15].

(2) With the help of project-based learning, students' cooperation ability was improved

Project-based learning advocates group collaborative learning. Students carried out positive exchanges in each group to complete the projects assigned by teachers, jointly analyze and solve problems. Students learned from each other's strengths to make up for their weaknesses in the process of communication and achieved common progress.

In this practice, several evaluation forms were designed to evaluate students' learning, which reflected the diversified idea of evaluation scheme under the new curriculum standard. Through these evaluation forms, students' mastery of knowledge and completion of tasks were well fed back. Students' evaluation of their own group, others' group, themselves and so on enabled them to reflect on their own advantages and disadvantages, learn their lack of knowledge and literacy from others, improve their competitive consciousness and stimulate their fighting spirit, so as to improve the overall teaching level. In addition, letting students become the main body of evaluation made students better understand the evaluation standards and objectives, and helped students adjust their behavior to achieve the teaching objectives.

In the process of group cooperative learning, students not only learned new knowledge, but also improved their ability of cooperation, and their thinking of solving problems was also developed in communication and discussion. After accepting the project-based teaching, the final examination results were more concentrated, that is, the gap between students became smaller, which showed that the task-driven method was conducive to solving the problem of large gap in students' knowledge base.

(3) The quality of tasks is related to the success or failure of project-based learning, sub tasks should not be isolated, but must form a complete system

Because the goal of task-driven teaching is to "learn by doing", through tasks to stimulate students' motivation and give students the opportunity to experience and practice, the design and organization of tasks are very important. The difficulty of tasks can neither be too large nor too low. And nor can tasks be hammered in the East and hammered in the West. If students can't complete tasks that are too difficult, they will feel frustrated. If the tasks are too easy, students will lack a sense of achievement.

In task design, this study took task decomposition as the core work. Under a large teaching goal, with the help of the relevant strategies of project management, the teaching goal was decomposed and instantiated into several executable small tasks. Small tasks constituted a complete task system. Each small task was closely related to the corresponding knowledge points, and the depth and breadth of the task were appropriate. Each task also had a strong hierarchy, from easy to difficult tasks, and there was progression between subtasks.

This study put forward the task design strategy of the system, and its effectiveness was confirmed by the data. This strategy was also consistent with the viewpoint of scholar Guo Shaoqing on "drawing the diagram of knowledge point structure ". However, the strategy proposed in this paper was more detailed and had better operability, and clearly explained how to draw and draw what kind of "knowledge structure diagram" [3].

5.3.2. Characteristics of This Study

Task-driven method is an effective teaching method to carry out information technology course. The feature of this study was the analysis and verification of task design method, and put forward a new scheme of teaching practice verification and diversified teaching evaluation.

1. Task design method

There were many theoretical studies on the application of task-driven method in information technology teaching, but few of them really paid attention to task design and task decomposition strategy [10]. This research focused on the systematic analysis and characteristics of task design, and introduced the WBS theory in project management into the process of task design, which was conducive to the refinement and decomposition of tasks, and formed an operable and structured design system.

This study believed that effective task decomposition strategy was conducive to ensure the integrity of task system and construct hierarchical and progressive task combination, so as to make it easier for students to understand and complete tasks and achieve the expected learning effect. The organization system of tasks focused on knowledge points and tasks focused on chapter and took learners at different levels into account, which was conducive to students' independent exploration and collaborative exploration.

2. Teaching practice verification

Based on rigorous teaching practice, this study ensured the landing of task-driven method and WBS theoretical research, summarized the teaching cases, experiences and problems needing attention in the teaching process, and carefully analyzed the limitations. It was a very meaningful teaching practice.

This study explored the effectiveness of teaching based on task design through the evaluation of three dimensions: academic achievement, learning interest and attitude and self-efficacy. The cultivation of information technology

literacy is inseparable from the cultivation of students' learning interest and internal motivation. Therefore, it is very important whether task driven teaching method can stimulate students' learning interest and enhance their sense of self-efficacy.

6. Conclusion

In order to solve the problems existing in information technology education, this study focused on the strategies and methods of task design, and explored the effectiveness of task -driven teaching in information technology course through teaching practice. This study proposed a task design strategy based on WBS. Through the measurement of academic achievement, learning interest and attitude and self-efficacy, it was proved that task-driven method could indeed promote students' learning, improve students' interest and enhance students' motivation, which had obvious advantages over traditional teaching.

Practice proved that the task-driven teaching method emphasized the concept of taking students as the main body, which was in line with the requirements of the new curriculum reform. It advocated carrying out personalized teaching through task-driven teaching, and also stratified students, which could teach students according to their aptitude. In the process of completing the task, students communicated with each other, and the spirit of unity and cooperation was improved.

7. Future work

In the near future, the author will continue to make persistent exploration in this field, take the project selection oriented to teaching objectives as the core, explore the design and application strategies of effective tasks, and improve students' learning initiative and autonomy, so as to achieve the talent training goal oriented to the development of innovative ability.

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