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Conception and Exploration of PBL Teaching Method in College Physics Teaching

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Abstract: University physics is a basic course. Most students are not motivated to learn university physics. The traditional teaching method is not ideal for students' improvement in university physics. It is necessary to improve teaching methods. The problem-oriented PBL (Problem-Based Learning) method can stimulate students' interest in learning and help students improve their grades. After thinking about and using PBL method in college physics teaching, it is found that the problem-oriented teaching method can effectively improve the enthusiasm and interest of students, and the students' performance is good.

1. Introduction

The traditional teaching method of the university physics curriculum faces many problems. For example, most of the students indicated that they were not clear about the objectives during the preparation, and they were more active at the beginning and basically did not preview in the later stage[1-3]. In the class, because university physics is a basic general education course, some contents are not closely related to some majors, and some students do not study seriously. The university physics curriculum faces a large number of students, including undergraduate and postgraduate students. The students have different physical foundations, and some students are prone to class. In general, students' enthusiasm for studying university physics is not high. PBL (Problem-Based Learning) teaching method is mainly problem-oriented [4-6], which can make students clear goals, study hard, and hope to improve students' interest in learning university physics, which is suitable for the current new talent training methods. Therefore, the PBL method is conceived and explored in the flexible application of university physics Teaching[7-9].

2. Hierarchical Problem

Problem-oriented, the setting of the problem is crucial. The problem needs to be of interest to the students, close to the reality of life, and more should be hierarchical[10-11]. Different stages of the teaching process use different questions, which can be roughly divided into pre-study settings, classroom problems, after-school problems, and technology application issues. The problem of preview setting is mainly used when students prepare for the class. Students are able to clarify the goals of the preview and prepare for it efficiently, rather than aimlessly previewing. The university physics curriculum faces a large number of students. The problem of pre-study setting should not be too difficult[12]. It should be a problem that students can solve by reading books or discussing with classmates, thus continuously stimulating students' enthusiasm for learning. For the release of the preview question, students can use the piecemeal time and use the mobile phone or computer to learn in real time through the network through the blue ink cloud class and the school online teaching platform. The problems in the classroom are mainly to activate the atmosphere of the classroom and to concentrate the attention of the students. When students answer questions through discussion, it is not easy to open a gap, and they can also think for themselves to improve the effectiveness of learning. The problem after class is mainly to consolidate the content of student learning, so that students can further digest and absorb knowledge. The application problem of science and technology is mainly that the physics teacher sets the problem of realistic scientific research according to the professional knowledge of the students and the content of the university physics course in advance. It can lead some students to study real-world problems, apply for science projects or participate in some competitions. For example, students can participate in the national Internet + contest. This makes the combination of university physics and student majors, and students apply what they have learned to promote learning, to promote learning, and to promote teaching.

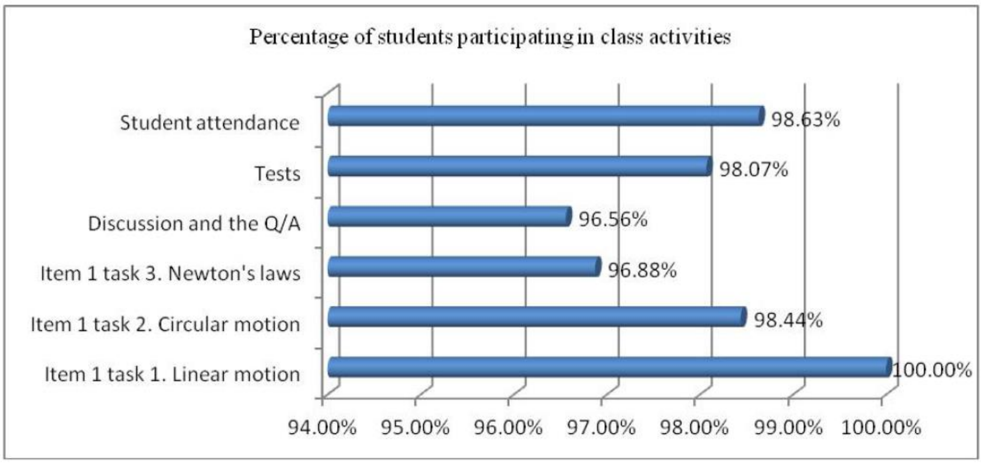

Figure 1: The percentage of students participating in class activities on the Blue Moyun Class Platform.

Take the communication profession as an example, preview the movement of the project 1 mass point Task 1 linear motion, task 2 circular motion and task 3 Newton's law setting problem, discuss the question and answer questions, classroom test settings, are all released through the blue ink cloud class platform. It can be seen from Figure 1 that the proportion of students actively participating in various activities has reached more than 96%, especially the proportion of people who are preparing for linear sports has reached 100%. After-school problems are published in the form of homework through the school's online teaching platform.

Figure 2 shows that 4.69% is excellent, 46.88% is good, and 40.63% is good, which fully reflects the students' positive goals after clear goals. The result of independent learning. Based on Figure 1 and Figure 2, it can be seen that by setting reasonable questions and layering problems, students can effectively promote learning. The initiative of students to learn is improved. By combining the university's physical content with the student's expertise to set up reasonable technology application issues, teachers can guide some students to apply for science and technology projects. Students use knowledge to solve practical problems while learning. According to Figure 3, it can be found that the overall grades of students with science and technology projects are better than the overall grades of classes without science and technology projects. This shows that setting scientific application problems can effectively guide students to actively learn and improve their interest in learning. Play a role in promoting learning.

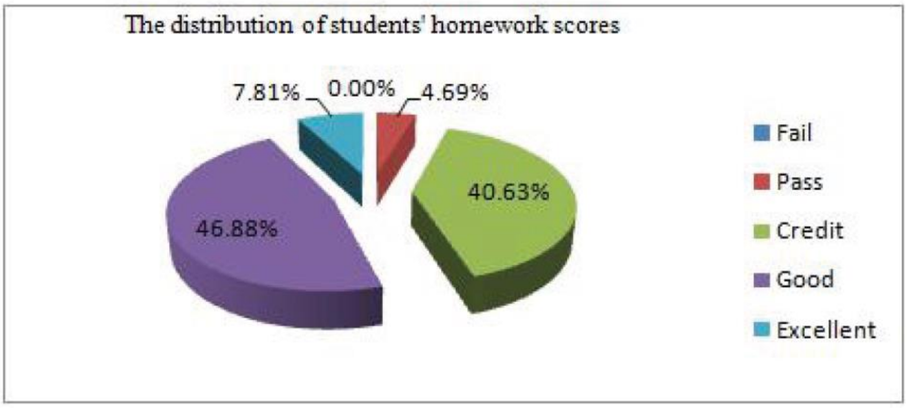

Figure 2: The distribution of students' homework scores on the school's Online Teaching Platform.

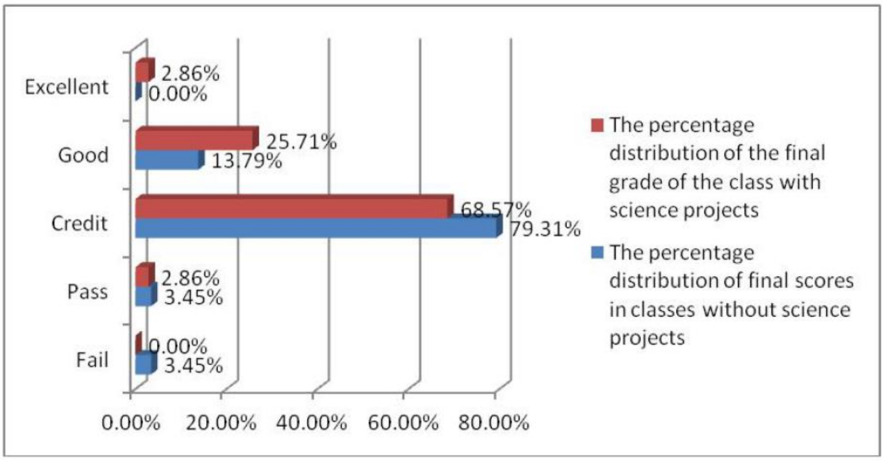

Figure 3: Comparison of final results of college physics experiments among different classes.

3. The Flexibility of the Classroom

Not limited to the traditional mode of PBL fixation, teachers adopt flexible and varied ways of class. When the problem is difficult and the time is sufficient, group discussion can be used to reflect the cooperation of learning [3] and cultivate the team spirit of the students. When the problem is relatively simple and the time is insufficient, the individual students can use the individual to answer the questions, reflect the independence of the study, and cultivate the students' ability to think independently. At present, university physics faces the problem of less class hours and more content. It is impossible for all questions and content to be implemented in the classroom for students' group discussion. Students can learn through online discussions. The whole class is a whole, each has its own opinions, learn together, and make progress together. The teacher plays a guiding role in it, taking students as the main body and reflecting the students' autonomy. In the classroom, set up some simple test questions corresponding to the knowledge points. Students can do a small test every time they complete a knowledge point. This avoids the tediousness of traditional teaching teachers, and the spirit of the students is relaxed, and students are not easy to make a difference. Figure 4 is a statistical diagram of some of the test questions that students have completed through the Blue Ink Cloud class.

According to Figure 4, it can be seen that the students are asked questions in the form of classroom test, and the proportion of students who actively complete the test questions is more than 90%. Students are more than 80% correct in answering each question. Explain that students are guided by small questions, students' initiative is improved, and students' scores are better.

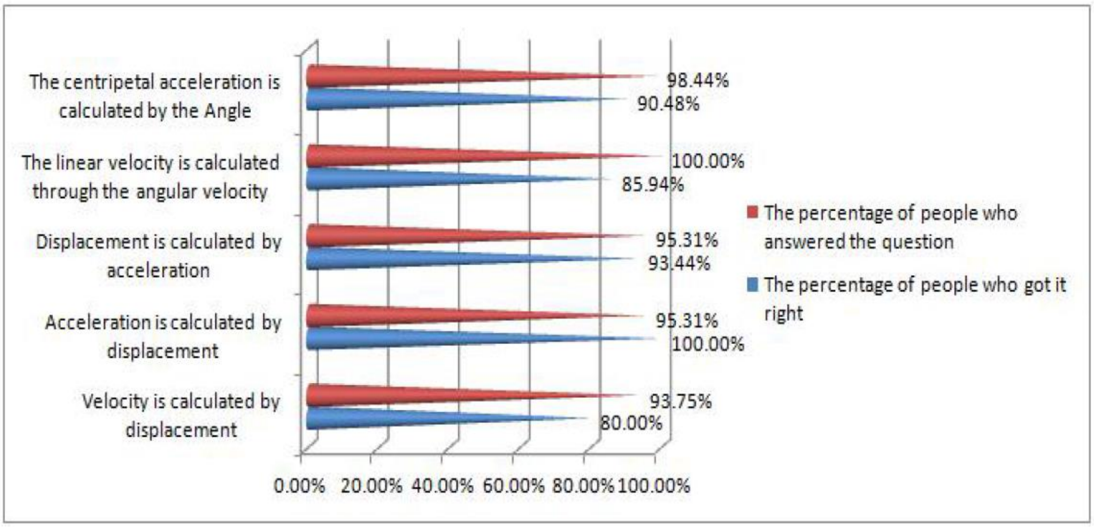

Figure 4: The participation rate and correct rate of students doing part of the test independently.

4. The Evaluation System in the Teaching Process

The evaluation system in the teaching process is crucial to teaching. Different evaluation systems directly affect the final direction of student learning. One is the student's self-evaluation. It is necessary to refine the student self-evaluation system and refine it to every physical theorem of each knowledge point. Through self-evaluation, students can master their own learning in real time. For the knowledge points that are not mastered, self-evaluation will encourage students to take the initiative to learn from other students or ask the teacher for guidance. The second is the mutual evaluation between students. There are a large number of students in the university physics curriculum, and it is difficult for teachers to ask questions for each student's classroom exercises. Students can upload their answers to each of the classroom exercises to the online learning platform, such as uploading to the homework/group task of the Blue Ink Cloud class, and the students will conduct mutual evaluation. Through mutual evaluation, students can understand their own deficiencies on the one hand, and learn the strengths of others on the other, and improve themselves better. The third is the teacher's evaluation of the students. By correcting the homework after the class, the teacher can timely understand the student's learning situation and give a reasonable evaluation in a timely manner. Students can learn about their strengths and weaknesses through the teacher's comments on the assignment. Teachers praise the advantages of student learning, which can stimulate students' confidence in learning, and students will actively learn and study hard. Teachers point out the insufficiency of students' learning, which allows students to realize that they don't understand a certain knowledge point in time, and encourage students to re-learn and review the knowledge points and make progress.

Figure 5 shows the relationship between the number of times and the score of each student's classroom question and answer evaluation in the communication major class of college physics. Figure 5 (a) shows the total score curve of teacher's evaluation on each student; Figure 5 (b) shows the number of times teachers evaluate each student; Figure 5 (c) shows the total score of each student's classroom test. By comparing figures 5 (a), (b) and (c), it can be found that in most cases, when the number and score of each student's classroom question and answer evaluation are relatively large, students' classroom test scores are relatively high; on the contrary, students' classroom test scores are relatively low. For example, for the students whose student number is 24, the number of times teachers evaluate their classroom Q & A is relatively high, which is 4 times; the evaluation score is relatively high, which is 13 points; the corresponding classroom test score is relatively high, which is 97.67 points. On the contrary, for example, if the student number is 49, the teacher does not evaluate the classroom question and answer, and the default evaluation score is 0; the corresponding classroom test score is relatively low, which is 71.79. Therefore, there is a positive correlation between teachers' evaluation and students' learning results. Scientific and reasonable teacher evaluation can stimulate students' learning motivation and promote them to study hard.

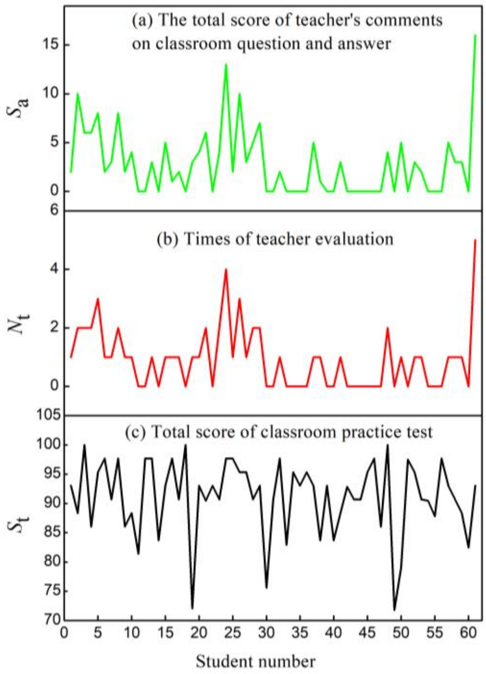

Figure 5: The relationship between students' classroom test scores and teachers' evaluation.

5. Concept and Effectiveness

The teacher guides some students to study the scientific questions raised according to actual needs, guide students to apply for science and technology projects or participate in competitions, and is guided by the scientific problems of integrating university physics knowledge and student professional knowledge. Inspire students to study hard and apply knowledge to solve practical problems. Realizing the use of learning; while students self-study encounter problems that they do not understand, they will expect teachers to explain relevant knowledge and achieve learning and learning. The teacher teaches the students well, the students directly use the knowledge to solve the real problems, the knowledge is transformed into the productive forces, the teaching is promoted, and the students' scientific research ability is continuously improved. Figure 6, Figure 7, Figure 8 and Figure 9 are for students to do technology. Part of the project's results.

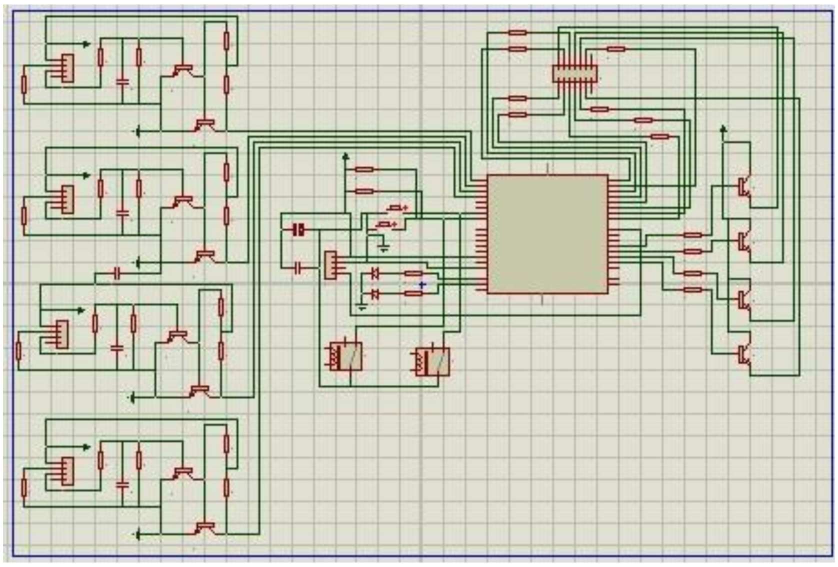

Figure 6: Schematic diagram of simulation circuit designed by students.

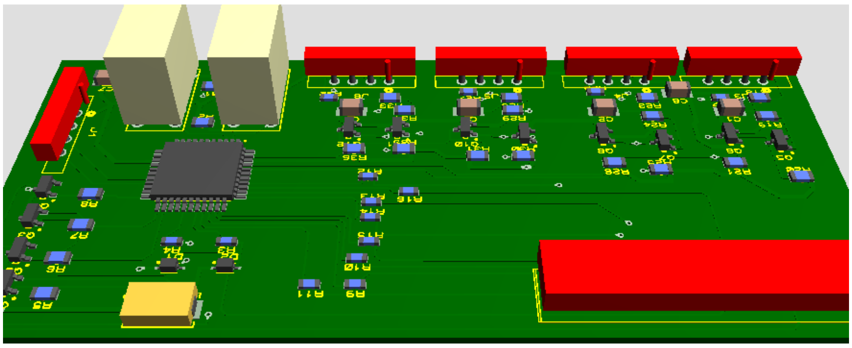

Figure 7: 3D circuit simulation diagram designed by students.

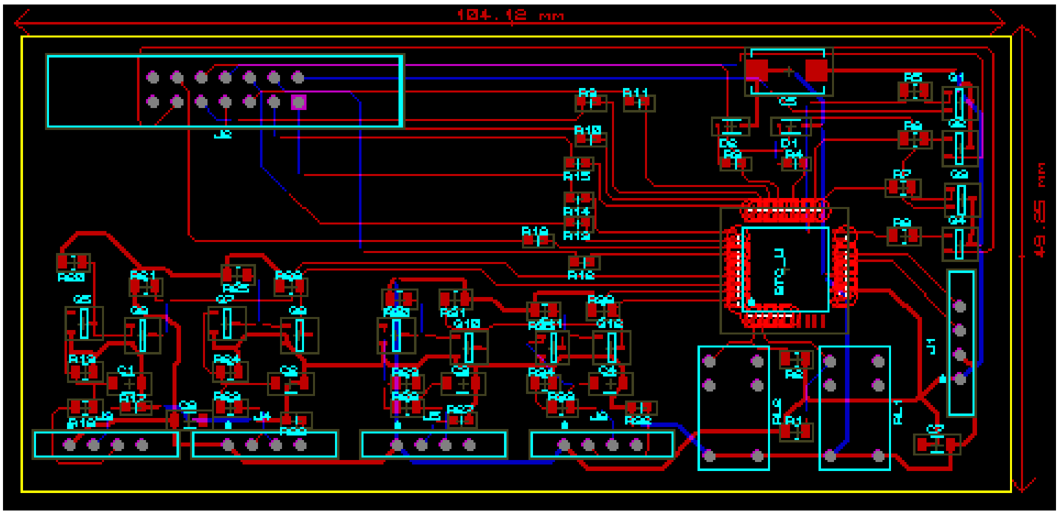

Figure 8: The PCB (Printed circuit board) diagram designed by students.

Some students participate in scientific research projects, play a leading role in the vanguard, create a good learning atmosphere, and further promote the whole class students to study hard. By analyzing Fig. 1, Fig. 2, Fig. 3 and Fig. 4, it can be found that the problem-oriented teaching method can effectively improve the enthusiasm and interest of students, and the students' performance is good.

Although the attempt of this method has achieved certain results, it also faces many difficulties.

Figure 9: The rotary inertia measuring instrument.

6. Conclusion

The whole process of college physics teaching is problem-oriented and flexible using the PBL method. First, guide students to self-prepare with the questions of the level of preparation. Then, to discuss the problem, the small test questions, etc., to promote students to study in the classroom seriously and focused. Then guide students to review and consolidate knowledge points at the post-class level. Finally, it is the scientific research problem that runs through the entire teaching process of university physics. For example, the setting of guiding problems needs to consider many factors. For each major, the physical foundation of each class is different, and it takes a lot of Time to set appropriate questions based on the physical content of the university and the actual situation of the student's professional knowledge. The teaching reform of university physics has a long way to go and it needs further research and Exploration of Teaching.

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