

Application of Research-Based Learning Model in College Physics Education

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ABSTRACT. *College physics is the basic content of natural science. It also contains a wealth of social science knowledge and research methods in the rich physical knowledge. This article will explore the application of research-based learning models in college physics education, outline research-based learning, analyze the necessity of applying research-based learning models in college physics education, and propose countermeasures for the implementation of research-based learning.*

KEYWORDS: *Research-based learning model, University, Physics education*

1. Research Study Connotation

Research-based learning refers to teachers guiding students to carry out creative learning activities and scientific research. Specifically, research-based learning refers to selecting and determining research topics from subject areas or real life, creating a scenario and approach similar to scientific research, allowing students to actively acquire knowledge, apply knowledge, and solve problems. So as to cultivate students' exploration spirit, innovation spirit and practical ability [1]. Students start their studies by way of inquiry, gain knowledge, master skills, and improve their quality through independent inquiry and free creation, which fully reflects the student's subjective status. In addition, research-based learning is not limited by time and space. Students can complete it anywhere. The learning materials are not limited to teaching materials. Students can obtain knowledge through multiple methods and channels. Students change the set thinking of the classroom into creative openness. Thinking, this learning is open. Research-based learning revolves around the raising and solving of problems, students ask questions because of doubt, and the cultivation of innovative spirit originates from problem situations. In the process of continuous problem solving, students' innovative ability, practical ability, scientific research ability, collaborative ability, and information The processing ability has been cultivated and forged, so the characteristics of research-based learning can be attributed to autonomy, openness, and innovation.

2. Feasibility of Applying Research-Based Learning Mode in College Physics Learning

2.1 University Physics as a Basic Engineering Course

College physics and its experimental courses have strong research characteristics. At the same time, the combination of college physics and advanced mathematics, computer, philosophy and other courses also provides opportunities for improving students' innovative ability and training top talents. Carrying out research-based learning in experimental course teaching will be an important way to achieve innovative education in college physics, and will also provide important theoretical basis for research-based learning in other disciplines [2].

2.2 Most Teachers Are Engaged in Teaching and Scientific Research At the Same Time

Most college teachers are also engaged in scientific research while engaged in teaching. In the process of long-term research on scientific research projects, they have not only profound professional knowledge and rich teaching experience, but also rich practical experience in project research. . In the process of guiding students to study, teachers can influence students through their own knowledge structure, research methods [3], practical experience and life experience, and at the same time can absorb students' bold conjectures and assumptions to broaden their research ideas. Such a learning process can not only stimulate students' interest in learning, improve students' practical ability, exploration ability and innovation ability, but also improve teachers' scientific

research ability, truly realize teaching proficiency, and create conditions for training top talents.

2.3 Laboratory Books Resources Opening Conditions

The open laboratories of universities and a large number of library resources also provide good conditions for students to conduct research-based learning. Experiment is the foundation of physics, and it has unparalleled superiority in cultivating students' practical ability, practical ability and creative ability. The laboratory's advanced instruments and equipment are used to design the experimental content, prepare the experiment itself, complete the experimental process, and analyze the experimental results, which is conducive to improving the comprehensive ability of students.

3. Research-Based Learning Applied to College Physics Implementation Measures

3.1 Create a Physics Context to Guide Research-Based Learning

In college physics classroom teaching, create physical situations related to the knowledge points for students, and let students summarize the physical knowledge contained in the situations by observing and thinking about the physical situations that they have set and combining their previous knowledge accumulation reasoning. , Help to improve students' thinking ability. For example, when introducing the concept of current density vector, students have been exposed to the concept of current intensity defined for area [4]. If the thickness of the wire (that is, the cross-sectional area) changes, the current intensity does not change. In this way, a physical situation can be created: a team of soldiers walking on a road from wide to narrow, if the walking speed is constant (the current intensity is constant), the distance between the soldiers is different between wide and narrow sections, This means that the distribution of the charge is different in different places where the thickness of the wire in the conductor is different, so the students will immediately have a situation where soldiers are crowding through the "narrow" section. Next, set the situation. If we want to distinguish between such different situations, what kind of physical quantity should be introduced? How to introduce it? The students immediately thought that the physical quantity and method for point definition should be introduced, so the concept of current density vector was connected with a crowd of soldiers to form an image memory, which was clearly printed in the students' minds and improved the students' association ability. In classroom teaching, teachers should create novel and appropriate situations as much as possible. They can also guide students to create situations themselves, stimulate students' interest in learning and participation, and enhance students' ability to think and develop independently in situations.

3.2 Research-Based Learning Involving Physics Experiments

Self-designed experimental teaching is a student-centered experimental teaching model that allows students to design and implement the experimental process independently. Carrying out design experiments can enable students to comprehensively use the theoretical knowledge, measurement methods, and research ideas they have learned to deeply study their expected experimental tasks, thereby cultivating students' ability to use the knowledge they have learned to find and solve problems.[5] In order to cultivate students' innovative ability and comprehensive scientific research quality, it provides a space for top talents to show their special talents. In the rectification and construction of the university physics laboratory, we got some interested students to participate and achieved good results.

3.3 Reviewing Literature and Literature for Research Study

In university physics teaching, students can be guided to read relevant literature and materials, and write literature reviews for research-based learning in conjunction with teaching content. The literature review requires a large amount of reading and understanding of the research area involved in the topic selection, a comprehensive analysis and induction of the research status of the main academic viewpoints, previous research results, existing problems, and the development prospects of the topic Organize, put forward your own opinions and research ideas at the same time, and finally make it clear in the form of articles [6]. Searching and reading literature is an important prerequisite for writing a review. Through searching, students can find the documents they need in a large amount of information materials, which greatly exercises the ability of students to screen information and read quickly, which is also the basic ability that top talents must have. Regularly writing

literature reviews can also enable students to keep abreast of scientific and technological knowledge and the development process of science and technology, which also plays an important role in cultivating students' practical, hard-working and pragmatic learning and living habits.

3.4 Participate in Scientific Research Projects for Research Learning

Scientific research projects are students' self-motivated research projects that are selected and designed by teachers under the guidance of their interests. It is one of the forms of research-based learning with a high degree of autonomy [7]. College students' scientific research projects include topics such as topic selection, filling in declaration forms, school expert group approval, project implementation, mid-term evaluation, and writing a final report. Before filling in the application form, students are required to read through the relevant literature of the selected topic, demonstrate the feasibility of selecting the topic, and form an argumentation report; clarify the project team members and specific division of labor; divide the research content of the research phase; clarify the expected form of research results; Reasonably estimate the budget and other related content in the research process. Each of these items can improve students' research learning ability and encourage students to participate in scientific research projects as much as possible. In this kind of training, outstanding talents will show their advantages in this area and stand out.

3.5 Encourage Students to Participate in Research Learning in Science and Technology Competitions

Various science and technology competitions provide opportunities for students' scientific and technological practice activities and research-based learning. Students prepare for the contest, defend the process, and observe other students' works on the spot, which can promote the interest in learning and develop innovative thinking. For example, you can organize and guide students to participate in competitions such as the "National Electronics Professional Talent Design and Skills Competition" and "Mechanical Design Competition". In addition to conducting research-based learning, teachers can guide students to take some more in-depth and cutting-edge professional issues as topics, or select some issues that are closely integrated with local technology, production, and life as topics for research and learning Related to graduation design, such as organizing students to participate in national college student electronic design competitions, mathematical modeling contests, etc., can also allow students to participate in teachers' research projects. In this way, students can not only mobilize their enthusiasm for learning, develop their intelligence, cultivate their ability, but also lay a good foundation for their future work and study.

4. Conclusion

In short, under the guidance of university professors, research-based learning has gradually become a learning activity for students to acquire knowledge, development ability and intellectual development independently, and carry out detailed research-based learning. Such learning is more conducive to the cultivation and improvement of students' exploration ability. As well as innovation ability, it has become one of the important ways to achieve innovative education in university physics.

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