

A Study on the Application and Effectiveness of Problem-oriented Inquiry-based Learning in Higher Education Classrooms

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Keywords: Problem-Based Learning; Higher Education; Application; Effectiveness Research

Abstract: With the development of science and technology and the updating of educational concepts, teaching methods in higher education are constantly changing. Among them, Problem-Based Learning (PBL) is a kind of teaching method that is getting more and more attention. The purpose of this paper is to discuss the application and effect of PBL in higher education classrooms.

1. Introduction

With the development of society and economic prosperity, higher education has become a necessary way for people to pursue higher quality of life and career development. However, traditional teaching methods can no longer meet people's new requirements and expectations for higher education. Therefore, a teaching method that pays more attention to students' independent learning, practical ability and innovation ability, PBL, has been gradually introduced into higher education classrooms. PBL is a problem-oriented learning method, which cultivates students' practical ability, innovation ability and independent PBL is a problem-oriented learning method. Compared with traditional teaching methods, PBL pays more attention to students' initiative and practicability, which can improve students' interest and motivation in learning, and thus improve the learning effect.

2. Application of PBL in higher education classroom

2.1 Application scope of PBL

Problem-Based Inquiry Learning (PBL) is an interdisciplinary teaching methodology that is applicable to a variety of subject areas, such as medicine, engineering, science and sociology. Whether it is a theoretical or practical course, PBL can provide a learning environment where students can gain deeper understanding and mastery through hands-on practice and self-directed inquiry. In the medical field, PBL can be applied to theoretical courses such as clinical diagnosis, case analysis and patient management. By introducing real clinical cases, students can engage in discussions and problem solving in a collaborative group setting to gain a deeper understanding of disease mechanisms, diagnostic methods and treatment options. In addition, in medical practice courses, students can participate in actual medical work through simulation experiments, patient models, and field internships to deepen their practical application and understanding of medical knowledge. In the engineering field, PBL can be applied to courses such as innovative design, engineering project management and problem solving. Students can face real engineering problems and research, design and implement solutions through teamwork and hands-on practice. Such a learning approach can cultivate students' innovative thinking, practical engineering skills and teamwork spirit, and equip them with the ability to solve complex engineering problems. In the field of science, PBL can be applied to courses such as science experiments, science research and science exploration. Students can independently select scientific problems and conduct experimental design, data analysis and interpretation of results. Through such a learning process, students can deepen their understanding of scientific principles and the scientific method, and develop scientific practice and research skills. In the field of sociology, PBL can be applied to courses such as social surveys, social problem studies and social change analysis. Students can choose a social issue of interest and conduct field research and data analysis so as to gain a deeper understanding of the causes and effects of social phenomena

and social change. Through this learning approach, students can develop critical thinking, social observation and research skills^[1].

2.2 How PBL is applied

There are several main ways of applying PBL (Problem Driven Learning). First, independent inquiry: students can choose their own problems in PBL and investigate and solve them independently. They need to acquire the required knowledge and skills and propose solutions through independent study, searching for information, and practicing. This approach develops students' independent thinking and independent learning ability, and promotes their active participation and in-depth thinking. Second, group work: students can also work in groups for cooperative inquiry and problem solving in PBL. Group members can work together on a problem, communicate and share their views and findings with each other, and work together to solve the problem. This approach develops students' teamwork and communication skills and improves their collaboration and problem-solving efficiency. Third, practical operation: in PBL, practical operation is an important way of application. Students can deeply understand and master the knowledge and apply it to the problem-solving process through practical operation and hands-on activities. For example, in the field of science, students can carry out experimental design and experimental operation; in the field of engineering, students can design and make engineering models or prototypes; in the field of sociology, students can carry out field research and data collection and so on. This approach fosters students' practical and innovative abilities, enabling them to apply theoretical knowledge to practical problems and propose solutions.

3. Research on the effect of PBL in higher education classroom

3.1 Effects of PBL on students' learning interest and motivation

The practice of PBL (Problem Driven Learning) has received more and more attention and recognition. Research has shown that PBL can not only improve students' learning, but also stimulate students' interest and motivation in learning, so that they can participate in learning more actively. First of all, the problems and tasks in PBL are closer to real life and more targeted and specific. These problems and tasks are usually directly related to the knowledge and skills students have learned and are closely related to real-life problems. Such problems and tasks can arouse students' interest, stimulate their curiosity and desire for inquiry, and prompt them to participate in learning more actively. Secondly, PBL emphasizes students' active and cooperative learning. Students in PBL need to take the initiative to find ways and means to solve problems, and need to communicate and collaborate with their classmates to work out solutions. This cooperative learning approach can promote students' communication and collision of ideas, and develop their teamwork and social interaction skills, thus improving learning outcomes. Finally, PBL emphasizes the subjectivity, personalization and autonomy of students' learning. Students in PBL can choose problems and directions independently based on their own interests and needs, and explore and solve them through independent learning and practical operation. This personalized learning approach allows students to play more personal strengths and characteristics in learning, so that learning is more in line with individual differences and development needs^[2].

3.2 Impact of PBL on students' practical ability and innovation ability

Recent studies have shown that PBL (Problem-Based Learning) can significantly improve students' practical ability and innovation ability. Through hands-on practice and independent inquiry, students can deeply understand and master knowledge and apply it to solve practical problems and innovate, thus cultivating outstanding practical and innovative abilities. First of all, PBL focuses on students' practical operation. Students are not only passively taught knowledge in PBL, but also deepen their understanding and application of knowledge through practical operation. For example, in the field of science, students can carry out experimental design and experimental operation; in the field of engineering, students can design and make engineering models or prototypes; in the field of art, students can participate in art creation and performances, etc. Through these practical activities,

students are able to transform the theoretical knowledge they have learned into practical operation ability and develop practical ability and skills. Secondly, PBL encourages students to conduct independent inquiry. Students in PBL can independently choose problems, formulate solutions and find relevant information and resources. They need to take the initiative to collect information, analyze problems, and come up with innovative solutions. This self-directed learning process encourages students to think actively, solve problems independently, and develops their creative sense and ability. In addition, PBL focuses on interdisciplinary integration. In the process of solving real-world problems, students need to integrate knowledge and skills from different disciplines and propose comprehensive solutions. This interdisciplinary learning approach promotes the connection and cross-application between disciplines and cultivates students' comprehensive thinking and innovation ability.

3.3 Impact of PBL on students' teamwork and communication skills

Recent studies have shown that PBL (Problem Driven Learning) can significantly improve students' teamwork and communication skills. Through cooperative group learning, students are able to develop and enhance their teamwork and communication skills to effectively solve problems and reach common goals. First, PBL focuses on group work. In PBL, students are usually divided into groups to face and solve problems together. This type of group work learning encourages students to have positive interaction and cooperation, which develops their awareness and ability to communicate and support each other. Students need to coordinate each other's viewpoints and opinions, work together to develop solutions, and divide up the work to accomplish tasks. Through such teamwork, students can feel the power of collective wisdom and develop excellent teamwork skills. Second, PBL emphasizes effective communication skills. In the process of cooperative group learning, students not only need to express their ideas and opinions clearly, but also need to listen to and understand the opinions and views of others. They need to learn to communicate effectively, including skills such as listening, questioning, discussing and debating. By communicating and discussing with group members, students are able to better understand the nature and complexity of issues and promote collision and inspiration of ideas. Meanwhile, by establishing positive communication and collaboration with group members, students developed good team communication skills. In addition, PBL focuses on feedback and assessment. In group work, students need to evaluate and give feedback to each other's work and performance. This feedback mechanism is crucial for students to improve their teamwork and communication skills. They need to learn to give positive encouragement and affirmation, as well as constructive criticism and suggestions for improvement, in order to promote better teamwork and communication. In addition, PBL is also able to develop students' innovation and practical skills. In PBL, students need to face a variety of complex practical problems and solve them through thinking, inquiry and research. In this process, they not only need to transform theoretical knowledge into practical solutions, but also need to have practical operation ability to realize these solutions. At the same time, PBL also focuses on the cultivation of students' innovation ability. Students need to come up with new ideas and solutions, or improve and optimize the original solutions to create better solutions. Such cultivation of practical operation and innovation ability lays a solid foundation for students' future career development^[3].

4. Conclusion

Through the study, it is found that PBL has a wide range of applications in higher education. It can not only stimulate students' learning interest and motivation, but also cultivate their practical ability, innovation ability and independent learning ability. PBL focuses on problem-driven, so that students can apply what they have learned in the process of solving practical problems, and cultivate their practical operation ability and problem-solving ability. Meanwhile, PBL emphasizes students' independent learning and develops their self-management and critical thinking skills. In addition, PBL promotes the development of students' teamwork and communication skills through cooperative group learning. Therefore, PBL is considered an effective teaching method for higher education, which helps to cultivate high-quality and high-level talents.

References

- [1] Luo Chunya, Ma Zhichao. Research on Project-based Learning Teaching Mode with Problem Orientation - Based on the Basic Courses of Electronics [J]. Journal of Hubei Second Normal College, 2023, 40 (08): 69-74+125.
- [2] Lai Shao-Cong. Effective construction of problem-oriented classroom teaching paradigm[J]. China University Teaching, 2021, (09): 17-21.
- [3] Qimuge, Lin Haihe. Classroom Teaching: Problem Oriented - Characteristics of Classroom Teaching in the Perspective of Basic Education Curriculum Reform[J]. Journal of Inner Mongolia Normal University (Education Science Edition), 2009, 22 (10): 119-121.