Research Progress on the Application of Flipped Classroom Combined with Problem-Based Learning in Clinical Nursing Education

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Abstract

This paper reviews the application of flipped classroom and Problem-Based Learning (PBL) teaching methods in clinical nursing education. The article introduces the background, definitions, characteristics, and combined advantages of these teaching approaches, and based on theories such as educational psychology, explores the implementation of teaching models, content reconstruction, resource preparation, and methods for promoting student autonomous and collaborative learning. Teaching effectiveness is evaluated in terms of knowledge acquisition, enhancement of practical skills, and satisfaction levels. The paper further discusses the advantages, challenges, and coping strategies of these teaching methods, aiming to provide innovative teaching models for clinical nursing educators to enhance teaching effectiveness and student learning experience.

Full Text

Preamble

Research Progress on the Application of Flipped Classroom Combined with PBL Teaching Method in Clinical Nursing Education

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Abstract

This paper reviews the application of flipped classroom and Problem-Based Learning (PBL) teaching methods in clinical nursing education. It introduces

the background, definitions, characteristics, and combined advantages of these pedagogical approaches, and explores implementation strategies for the integrated teaching model, content reconstruction, resource preparation, and methods for promoting student autonomy and collaborative learning based on educational psychology theories. The paper evaluates teaching effectiveness across multiple dimensions including knowledge acquisition, clinical skill improvement, and student satisfaction. Furthermore, it discusses the advantages, challenges, and coping strategies associated with this combined approach, aiming to provide clinical nursing educators with innovative teaching models that enhance both educational outcomes and student learning experiences.

Keywords: Flipped Classroom; PBL Teaching Method; Nursing Education; Research Progress

Introduction

With the continuous development of modern medical education, clinical nursing teaching models are undergoing constant exploration and innovation. In recent years, flipped classroom and Problem-Based Learning (PBL) have gained widespread attention due to their unique pedagogical advantages. This paper examines research progress on the combined application of flipped classroom and PBL in clinical nursing education, with the aim of providing new teaching strategies and methods for nursing education. As China's healthcare system rapidly develops, the nursing workforce is becoming increasingly younger. According to the *National Nursing Development Plan (2021-2025)*, by the end of 2020, the total number of registered nurses nationwide exceeded 4.7 million, representing a 45% increase compared to 2015. Nurses with college-level education or above accounted for over 70% of the workforce, indicating significant improvement in educational qualifications [1]. However, new nurses face numerous challenges in clinical practice, including a disconnect between theoretical knowledge and clinical practice, and insufficient autonomous learning capabilities. These issues have prompted educators to explore more effective teaching models to enhance nursing education quality. The combination of flipped classroom and PBL aims to transform traditional teaching models by improving students' autonomous learning abilities and clinical operational skills. Flipped classroom emphasizes pre-class self-learning of theoretical knowledge through videos and other resources, while class time is devoted to discussion, practice, and problem-solving. PBL, in turn, uses problems as the starting point to promote active inquiry and teamwork. This integrated approach holds promise for improving nursing students' clinical thinking and practical abilities, offering new perspectives and methods for clinical nursing education [2][3].

1.1 Definition and Characteristics of Flipped Classroom

The flipped classroom originated from the renowned American non-profit educational platform "Khan Academy," with its initial prototype emerging in 2004. By 2007, two teachers at Woodland Park High School in the United

States—Jonathan Bergmann and Aaron Sams—began experimenting with this new teaching model [4]. They recorded instructional videos to help absent students catch up and first applied this flipped classroom approach to high school chemistry courses. In this model, students were required to learn new knowledge through online video resources before class, while classroom time was primarily devoted to answering questions and facilitating in-depth discussions. This innovative and effective teaching approach gained widespread popularity among students [5]. The core of flipped classroom lies in reorganizing the learning process, reversing the traditional "lecture in class, homework after class" model. Students engage in autonomous learning outside the classroom, while class time is dedicated to problem-solving and discussion to promote deeper understanding and internalization of knowledge [6]. Flipped classroom is characterized by its emphasis on students' autonomous acquisition of new knowledge outside class through videos and reading materials, with classroom time focused on interaction and in-depth discussion. Additionally, instructional videos should be designed to be concise and clear to enhance learning efficiency [7].

1.2 Definition and Characteristics of PBL Teaching Method

PBL is a student-centered teaching strategy that promotes active learning and deep understanding through group discussion and research around specific, open-ended problems [8]. PBL is characterized by its emphasis on using problems as the starting point for learning, guiding students to conduct all learning activities through student-centered autonomous, cooperative, and inquiry-based approaches. PBL highlights students' central role in the learning process, differing from traditional teacher-centered models by placing greater emphasis on active participation and hands-on practice. This teaching method not only transforms the educational philosophy that previously prioritized theoretical knowledge over practical skills but has also gained widespread application in educational practice. Through PBL, students develop comprehensive abilities in the process of problem-solving, thereby promoting overall quality improvement [9].

1.3 Advantages of Combining Flipped Classroom and PBL

The combination of flipped classroom and PBL can fully leverage the strengths of both approaches, forming a complementary teaching model. The pre-class autonomous learning in flipped classroom provides the necessary knowledge foundation for PBL, while PBL's group discussions and problem-solving activities offer a platform for in-depth exploration in flipped classroom. This integration not only enhances students' learning motivation and engagement but also promotes the development of comprehensive competencies, including critical thinking, teamwork, and self-management skills. Research by Lin Fang [10] and colleagues suggests that the combined flipped classroom and PBL model better enables nursing students to actively understand and master relevant knowledge during the learning process, improving their independent thinking and com-

prehension abilities, which is beneficial for enhancing learning efficiency. Mao Junhuan [11] and colleagues similarly believe that using WeChat-assisted PBL combined with flipped classroom can increase students' interest in learning, strengthen their autonomous learning abilities, problem-solving skills, and team spirit. This approach also helps nursing students better understand and apply knowledge and skills in emergency nursing.

2.1 Educational Psychology Theory

Educational psychology theory provides a solid theoretical foundation for combining flipped classroom and PBL. This theory emphasizes that learning is an active process in which students construct knowledge through interaction with their environment. Educational psychology posits that learning involves not only knowledge accumulation but also the construction of cognitive structures and the development of thinking abilities. In flipped classroom, students learn independently through videos and other materials before class, then deepen their understanding through discussion and practice in class—an approach that aligns with educational psychology's emphasis on active learning and knowledge construction. Additionally, educational psychology addresses learning motivation, learning styles, and individual differences, all of which play important roles in both flipped classroom and PBL [12].

2.2 Adult Learning Theory

Adult learning theory, particularly Andragogy, provides theoretical support for the combination of flipped classroom and PBL. This theory emphasizes adult learners' autonomy, the importance of experience, and intrinsic motivation [13]. Both flipped classroom and PBL encourage students to learn according to their interests and needs, which aligns with the core principles of adult learning theory. Furthermore, adult learning theory suggests that adult learners tend to connect learning with real-life experiences, which is achieved in PBL through solving practical problems.

2.3 Constructivist Learning Theory

Constructivist learning theory serves as the primary theoretical foundation for PBL and is equally applicable to flipped classroom. This theory posits that knowledge is not passively received but actively constructed by learners. In the combination of flipped classroom and PBL, students construct knowledge through solving real-world problems, a learning approach that promotes active exploration and deep understanding. Constructivist learning theory also emphasizes the design of learning environments, including social interaction and collaborative learning, which are reflected in the group discussions of flipped classroom and the learning activities of PBL [14].

3.1 Implementation Steps of the Teaching Model

The implementation of flipped classroom combined with PBL in clinical nursing education typically follows this process: First, teachers design pre-class learning materials, including video lectures and reading materials, to enable students to independently learn theoretical knowledge before class. Next, in the classroom, teachers guide students in group discussions centered on clinical cases to promote deeper understanding and application of knowledge [15]. Finally, through clinical simulations, role-playing, and other forms, students apply theoretical knowledge to practical operations, thereby improving their clinical competencies.

3.2 Content Reconstruction and Resource Preparation

In the integration of flipped classroom and PBL, content reconstruction is crucial. Teachers need to reorganize traditional teaching content according to the PBL model, designing challenging problems to stimulate students' interest and desire for inquiry. Simultaneously, teachers must prepare appropriate teaching resources, such as clinical cases, simulated patients, and operation videos, to support students' autonomous learning and classroom discussions [16].

3.3 Promoting Student Autonomous and Collaborative Learning

The combination of flipped classroom and PBL emphasizes student autonomous and collaborative learning. Students master necessary theoretical knowledge through pre-class autonomous learning, then solve clinical problems through group cooperation in class. This learning approach helps cultivate students' critical thinking and teamwork abilities. Teachers act as guides and facilitators in this process, helping students deepen understanding and apply knowledge through questioning, feedback, and guidance [17]. In clinical teaching of acute mastitis, PBL enables students to actively learn and explore by researching ancient physicians' disease nomenclature, comparing Chinese and Western medicine treatment approaches, and investigating characteristic external treatment methods of Traditional Chinese Medicine. Students solve problems through literature searches and group discussions, with teachers providing guidance. This

4.1 Theoretical Knowledge Acquisition

The application of flipped classroom combined with PBL in clinical nursing education has significantly improved students' mastery of theoretical knowledge. Research indicates that compared with traditional teaching models, flipped classroom provides students with more personalized learning pathways, while PBL promotes deeper understanding of knowledge through case analysis [19]. In the combined flipped classroom and PBL model, teachers connect foundational knowledge, current nursing management content, and potential clinical cases through progressive questioning. By creating audio or video materials, teachers

help students experience learning enjoyment outside class. Additionally, by having students research assigned problems before class through various books and online resources, the approach enhances students' information retrieval skills, laying a foundation for future learning and research [20][21].

4.2 Improvement in Clinical Operation Skills

The combination of flipped classroom and PBL has also demonstrated positive effects in improving students' clinical operation skills. Through pre-class video learning and in-class case discussions, students can practice operations in simulated clinical environments. This teaching model helps students better understand and apply theoretical knowledge in practical operations. The integrated approach not only enhances students' memory of theoretical knowledge but also improves their ability to apply it in clinical practice [22]. Furthermore, PBL encourages students to actively explore and solve problems, which is crucial for improving their clinical decision-making and operational skills [23]. In obstetric nursing education, the implementation of flipped classroom combined with PBL has shown significant results. Teachers using this model create simulated clinical practice scenarios that place students at the center of learning. Teachers guide students to participate in actual clinical operations while providing necessary guidance. This teaching method not only helps improve students' practical skills but also effectively assesses their ability to respond to and handle problems in clinical situations [24].

4.3 Teaching Satisfaction and Student Feedback

Teaching satisfaction and student feedback are important indicators for evaluating teaching effectiveness. The combination of flipped classroom and PBL can enhance students' learning enthusiasm and engagement, thereby improving teaching satisfaction. Students generally report that this teaching model enables them to participate more actively in the learning process and receive more personalized guidance and feedback in class [25]. PBL combined with flipped classroom not only improves students' test scores but also effectively cultivates their clinical thinking in Traditional Chinese Medicine. It enhances students' comprehensive abilities in learning, innovation, and adaptability, thereby improving their overall quality [26]. Additionally, internet-based flipped classroom combined with PBL, leveraging online resources and communication convenience, enables teachers and students to better implement both teaching methods, improving teaching effectiveness in nursing management and enhancing student mastery and satisfaction [27].

5.1 Challenges

The implementation of flipped classroom and PBL requires abundant teaching resources and technical support, including high-quality videos, electronic literature, and online teaching platforms, which may necessitate additional investment and technical assistance. Teachers' role transformation presents another

challenge, as they become facilitators and guides rather than traditional instructors, requiring new competencies in designing and guiding PBL activities. Students must also adjust their learning habits, shifting from traditional passive learning to active and autonomous learning, which requires adaptation and cultivation. Finally, establishing effective evaluation and feedback mechanisms is essential to monitor and assess student progress and teaching effectiveness.

5.2 Coping Strategies

To address these challenges and optimize teaching effectiveness, several strategies can be implemented. First, to meet resource and technical needs, educational institutions can establish teaching resource sharing platforms and provide training to enhance teachers' information technology competencies, ensuring effective resource utilization [28]. The transformation of teachers' roles requires professional development training in PBL methodology and peer collaboration to improve instructional design and implementation capabilities. Second, to help students adapt to the new learning model, educators can design engaging pre-class tasks and classroom activities that stimulate autonomous learning. Additionally, establishing learning support systems that provide guidance on learning strategies and time management skills can facilitate students' adaptation to autonomous learning. Finally, to ensure teaching effectiveness, implementing diversified evaluation methods and timely feedback mechanisms can comprehensively assess student learning outcomes and enable students to understand their progress and identify areas for improvement, allowing for necessary adjustments [29]. Through these strategies, the challenges facing the combination of flipped classroom and PBL in clinical nursing education can be effectively addressed, improving both teaching effectiveness and student learning experience.

6. Conclusion and Outlook

Flipped classroom transforms traditional information delivery into a new model of problem analysis and clarification, enabling nursing students to fully analyze and apply relevant knowledge points [30]. PBL facilitates learning and application of knowledge behind problems through cooperative problem-solving by setting appropriate "questions" [31]. The integrated teaching model of flipped classroom and PBL effectively enhances students' theoretical knowledge and clinical operation skills while improving teaching satisfaction. Grounded in educational psychology, adult learning, and constructivist learning theories, this combination promotes student autonomous and collaborative learning through content and resource reconstruction, thereby improving clinical thinking and problem-solving abilities. Student feedback is crucial for evaluating teaching effectiveness and improving instructional methods, while challenges such as variations in students' autonomous learning abilities and insufficient teaching resources require strategies like strengthening autonomous learning capacity building and optimizing resource allocation.

This study offers several implications for future clinical nursing education. First,

educators should explore and practice new teaching models, such as the combination of flipped classroom and PBL, to improve teaching effectiveness and learning experiences. Second, teachers should transform their role from knowledge transmitters to learning guides and facilitators, paying greater attention to students' individualized needs. Third, modern educational technologies such as online learning platforms and simulation tools should be utilized to provide rich, interactive learning resources. Additionally, continuous teaching evaluation mechanisms should be established to regularly collect and analyze teaching data for ongoing improvement. Finally, interdisciplinary collaboration should be encouraged to promote knowledge integration and innovation, providing students with comprehensive learning experiences. The application prospects of flipped classroom combined with PBL in clinical nursing education are broad, but continuous exploration and refinement in practice are needed. Through sustained research and practice, this teaching model can be expected to play an even greater role in future clinical nursing education.

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Note: Figure translations are in progress. See original paper for figures.