

# Implementing PBL Teaching in Hepatobiliary Surgery Clerkship Courses



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**Abstract:** The medical education landscape has transformed from traditional lecture-based methods to more student-centered learning approaches. This shift is essential for meeting the evolving needs of students and the healthcare environment. Problem-based learning (PBL) stands out among various innovative methods due to its unique educational philosophy and methodology, which have gained widespread recognition and adoption. This paper focuses on applying the PBL teaching model in hepatobiliary surgery clerkship courses, aiming to introduce fresh perspectives and methodologies into medical education. The study's primary objective is to explore the effectiveness of the PBL teaching model in hepatobiliary surgery clerkship courses and its role in fostering a student-centered learning environment. The PBL model emphasizes student engagement and active learning, which is crucial for developing critical clinical reasoning, problem-solving abilities, and teamwork skills. By incorporating the PBL model into the curriculum, the study aims to enhance students' capabilities in handling complex clinical scenarios, thereby improving their overall learning experience. The research methodology includes a comprehensive retrospective analysis of previous literature and experiences from past implementations of the PBL model in medical education. This approach provides a deep understanding of the model's impact, identifying best practices and areas for improvement. The following results were obtained. Findings highlight the significant positive effects of the PBL teaching model on students' clinical reasoning, problem-solving abilities, and teamwork skills in hepatobiliary surgery clerkship courses. Students exposed to the PBL model show substantial improvements in analyzing and solving complex clinical problems, working effectively in teams, and applying theoretical knowledge in practical settings. These results affirm the PBL model's effectiveness in promoting student-centered learning and its potential to significantly enhance students' clinical capabilities. Moreover, the study reveals that the PBL model creates a more engaging and interactive learning environment, encouraging active participation and inquiry-based learning. This shift is instrumental in preparing students for the dynamic nature of clinical practice. In conclusion, applying the PBL teaching model in hepatobiliary surgery clerkship courses significantly advance medical education. It fosters a student-centered learning environment and substantially enhances students' clinical reasoning, problem-solving, and teamwork skills. The study offers valuable insights into the evolution of teaching methodologies in medical education, providing a robust framework for active learning and engagement. The PBL model promises to shape the future of medical education, ensuring it remains responsive to student's needs and the broader healthcare landscape.

**Keywords:** Problem-Based Learning; Hepatobiliary Surgery Department; Probationary Course

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## 1 Introduction

The transformation of medical education, initiated by the PBL model originating from McMaster University in

Canada during the late 1960s, has marked a significant shift from traditional lecture-based methods to a more

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student-centered approach [1]. This innovative model has fostered a dynamic and engaging learning environment that promotes group collaboration and self-directed learning by emphasizing problem-solving at the core of the learning process. Its effectiveness in enhancing critical thinking, problem-solving capabilities, and teamwork skills among students offers a substantial improvement over conventional teaching methods [2]. Adopting the Problem-Based Learning (PBL) model across various medical specialties, including hepatobiliary surgery, underscores its versatility and effectiveness in improving educational outcomes [3]. This paper delves into applying the PBL teaching model within hepatobiliary surgery clerkship courses, aiming to inject fresh perspectives and methodologies into medical education. The main purpose of this study is to explore how to teach the PBL model in the course of hepatobiliary surgery. Employing a comprehensive retrospective analysis of literature and previous implementations of the PBL model in medical education, the research methodology seeks to provide a deep understanding of the model's influence, pinpointing best practices and areas for enhancement.

In summary, integrating the PBL teaching model into hepatobiliary surgery clerkship courses represents a significant leap forward in medical education. It nurtures a student-centered learning environment and significantly enhances students' clinical reasoning, problem-solving abilities, and teamwork skills [4, 5]. The study contributes valuable insights into the evolution of teaching methodologies in medical education, offering a solid framework for active learning and engagement. The PBL model's promise to reshape the future of medical education ensures it remains attuned to the needs of students and the evolving healthcare landscape.

## 2 Characteristics and Implementation Steps of the PBL Teaching Model

At its essence, the PBL model is distinguished by its focus on student-centered learning driven by problem-solving. This process encompasses the presentation of problems, self-directed learning phases, group discussions, reporting, and feedback sessions, and concludes with a summary and reflection [6]. This process encompasses the presentation of problems, self-directed learning

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In the context of hepatobiliary surgery clerkship courses, the application of the PBL model follows specific steps designed to optimize learning outcomes and enhance students' clinical and operational competencies. The initial phase involves presenting students with real-world clinical problems, encouraging them to identify learning objectives and engage in self-directed research [7]. This is followed by group discussions, where students collaboratively explore solutions and share insights, fostering a deep understanding of the subject matter and enhancing teamwork skills [8]. Subsequently, students report their findings and receive feedback, allowing for integrating new knowledge and refining their problem-solving strategies. The final phase involves summarizing the learning experience and reflecting on the knowledge gained and the skills developed. This reflective practice is crucial for consolidating learning and fostering continuous improvement [9].

The design of interdisciplinary problems that span multiple medical fields, such as internal medicine, surgery, radiology, and pathology, is encouraged. This approach prepares them for the complexities of real-world medical practice, making them more competent and confident healthcare professionals.

### 2.1 Problem Design and Presentation

The initial step in constructing educational content involves the teaching team creating challenging and relevant questions based on the hepatobiliary surgery curriculum and the demands of clinical practice. These questions often cover various aspects, including disease diagnosis, treatment option selection, surgical method comparison, and patient management. The design of interdisciplinary problems that span multiple medical fields such as internal medicine, surgery, radiology, and pathology is encouraged. This approach aids students in forming a comprehensive understanding of medical knowledge and appreciating the interconnections between different medical disciplines.

Through this method, students can gain a comprehensive enhancement of theoretical knowledge and apply what they have learned more adeptly in practical clinical operations, thereby better serving patients in future medical practices. Moreover, this interdisciplinary problem design can stimulate students' innovative thinking, encouraging them to think outside the box when faced with complex medical issues and find more effective solutions [10].

To ensure the quality and practicality of the problems, the teaching team needs to closely follow the latest medical research findings and clinical guidelines, ensuring that the designed problems reflect the most recent advancements in the medical field. Additionally, through a regular feedback mechanism, the teaching team can adjust and optimize the problems based on students' learning outcomes and feedback, ensuring the continuous updating and improvement of the teaching content.

In summary, through carefully designed interdisciplinary problems, students can enhance their mastery of professional knowledge in hepatobiliary surgery and cultivate their comprehensive thinking and innovative abilities, laying a solid foundation for their future development in the medical field. Implementing this teaching method requires the teaching team to be forward-thinking and have a continuously innovative spirit to ensure the high quality and relevance of the teaching content, thereby maximizing students' learning outcomes and clinical practice capabilities.

## 2.2 Self-Directed Learning

Upon being presented with the problem, students initiate a self-directed learning journey. They delve into relevant literature, guidelines, and clinical research reports to build a foundational understanding of hepatobiliary diseases, their diagnostic methods, and treatment strategies. During this critical phase, educators must supply essential resources and guidance, ensuring students' information gathering is both efficient and effective. This support might encompass providing access to medical databases, curating recommended reading lists, or organizing specialized lectures tailored to deepen their understanding of the subject matter. Through this process, students are equipped with the necessary tools to navigate the complexities of hepatobiliary medicine, fostering a proactive and informed approach to learning [11, 12].

## 2.3 Utilizing Modern Technology for Learning

Incorporating cutting-edge technologies like Virtual Reality (VR) and Augmented Reality (AR) into educational frameworks can profoundly transform the learning landscape, especially in clinical education. These technologies offer students unparalleled immersive experiences, making learning complex clinical scenarios, such as hepatobiliary surgeries, more engaging and realistic.

Through VR simulations, learners have the opportunity to navigate through intricate surgical procedures visually, gaining hands-on experience in a completely safe environment. This enhances their understanding of the subject matter and significantly improves their clinical skills without the risks associated with real-life surgeries. AR further complements this learning experience by overlaying digital information onto the real world, offering a hybrid learning environment that can be particularly beneficial in understanding the spatial relationships and procedural steps critical in surgery. By integrating VR and AR into the curriculum, educators can provide a dynamic and interactive learning experience that prepares students more effectively for the challenges of clinical practice [13].

## 2.4 Integrating Clinical Practice

A fundamental aspect of the PBL approach is the seamless integration of theoretical knowledge with hands-on clinical experience. This integration is crucial for medical education, particularly in specialized fields such as hepatobiliary medicine [14]. The PBL model achieves this by actively involving students in actual clinical activities, including but not limited to patient follow-ups and the observation of surgeries.

Engaging in patient follow-ups allows students to see the progression of diseases and the impact of various treatment strategies over time. This real-world exposure helps them understand the practical implications of their theoretical knowledge and the importance of personalized patient care. On the other hand, observing surgeries provides a unique opportunity to witness the application of surgical techniques and decision-making processes in a live setting. It offers an invaluable learning experience that textbooks or simulations alone cannot replicate.

This blend of theory and practice not only deepens students' understanding of hepatobiliary diseases but also significantly refines their clinical skills. By applying learned knowledge in real-world settings, students can better appreciate the complexities of medical practice and the critical role of interdisciplinary collaboration in patient care. Moreover, this approach fosters a deeper engagement with the material, encouraging critical thinking, problem-solving, and the development of a compassionate approach to patient management.

In summary, the integration of theoretical knowledge with practical clinical experience is a key component of the PBL model, enhancing the educational experience by

providing students with a comprehensive understanding of hepatobiliary diseases and honing their clinical skills through direct involvement in patient care and surgical observations. This method prepares students effectively for their future roles in the medical field, ensuring they are well-equipped to handle the challenges of clinical practice.

## 2.5 Group Discussion

After the self-directed learning phase, students transition into a collaborative phase where they engage in group discussions to dissect and solve the problem at hand [15]. This stage is pivotal for several reasons:

**Listening to Diverse Perspectives:** It encourages students to listen actively to their peers and understand diverse viewpoints. That would lead to a more comprehensive understanding of the problem. **Articulating Personal Viewpoints:** Students are prompted to articulate their perspectives, contributing their unique insights and knowledge gained during the self-directed learning phase. **Critical Thinking and Logical Reasoning:** The group setting fosters an environment where critical thinking and logical reasoning are paramount. Students challenge each other's ideas and reason through complex problems, refining their analytical skills. **Role of Teachers:** Teachers act as facilitators and observers rather than direct instructors in this phase. Their role is to ensure that discussions remain thorough, inclusive, and on track. They may intervene to guide the conversation, encourage quieter students to participate, or provide additional information when necessary. This collaborative discussion phase is essential in the PBL model as it not only enhances students' understanding and problem-solving skills but also prepares them for real-world medical teamwork. Listening, articulating, and reasoning are keys to successful patient care.

## 2.6 Reporting and Feedback

Following the collaborative discussion phase, each group takes the stage to present their findings and proposed solutions to the entire class. This step is crucial for several reasons:

**Receiving Feedback:** Presentations allow students to receive constructive feedback from teachers and peers. This feedback provides valuable insights, helping students refine their solutions and approach to problem-solving [16].

**Gaining Diverse Perspectives:** By listening to the presentations of other groups, students are exposed to dif-

ferent viewpoints and solutions to the same problem. This exposure broadens their understanding and encourages them to consider alternative approaches in future scenarios.

**Developing Public Speaking Skills:** The act of presenting in front of the class helps students develop effective public speaking skills. This is an essential competency in the medical field, where professionals often need to communicate complex information clearly and persuasively.

**Engaging with Experts:** Inviting experts in hepatobiliary medicine to participate in lectures and discussions enriches the learning experience. These experts can provide professional insights, share real-world experiences, and offer feedback on student presentations. This interaction not only enhances students' understanding of the subject matter but also improves their problem-solving abilities by exposing them to the expertise and perspectives of seasoned practitioners.

This interactive process of presenting and receiving feedback is a key component of the PBL model. It not only consolidates students' learning but also prepares them for the realities of medical practice, where effective communication, the ability to consider diverse perspectives, and the skill to solve complex problems collaboratively are indispensable.

## 2.7 Summary and Reflection

The final stage of the PBL process is a critical phase where reflection and summary take center stage. This stage is designed to allow students to introspectively evaluate their learning journey, taking into account the feedback received from both peers and teachers [17]. It's a moment for them to identify both their strengths and the areas where further knowledge and skill development are needed. Here's how this stage unfolds and its significance:

**Reflection Sessions:** Teachers play a pivotal role by facilitating reflection sessions. These sessions are structured to encourage students to share their insights about their learning experiences openly. It's a time for students to reflect on what they've learned, how they've applied their knowledge, and what challenges they encountered. This reflective practice is essential for deep learning, as it helps students internalize their experiences and understand their learning process on a deeper level.

**Identifying Improvement Areas:** Through reflection, students are encouraged to critically assess their performance and identify specific areas where they need further improvement. This could involve deepening their understanding of certain topics, enhancing their research skills,

or improving their clinical practice techniques. Recognizing these areas is the first step toward continuous learning and improvement.

**Presentations of Learning Outcomes:** Organizing presentations where students can showcase their learning outcomes serves multiple purposes. Firstly, it acts as a summary of what they have achieved throughout the PBL process, allowing them to see the tangible results of their efforts. Secondly, it serves as a motivational tool. By presenting their achievements, students not only gain a sense of accomplishment but are also inspired to engage in deeper research and exploration. These presentations can also foster a sense of community and shared learning among students, as they celebrate each other's achievements and learn from one another.

**Setting Future Learning Goals:** The final stage also involves setting future learning goals. Based on their reflections and the feedback received, students, with the guidance of their teachers, can set specific, measurable, achievable, relevant, and time-bound (SMART) goals for their future learning. This goal-setting process is crucial for maintaining the momentum of learning and ensuring that students remain engaged and motivated to continue their educational journey.

In summary, the reflection and summary stage of the PBL process is integral for consolidating learning, fostering continuous improvement, and setting the stage for future educational endeavors. It ensures that the PBL process doesn't just end with the solution of a problem but serves as a stepping stone for lifelong learning and professional development.

### 3 Teaching Effectiveness Assessment

To comprehensively assess the effectiveness of the PBL teaching model in hepatobiliary surgery clerkship courses, a multifaceted evaluation approach combining quantitative analysis and qualitative observation is recommended. This assessment aims to identify differences in theoretical knowledge acquisition, clinical reasoning abilities, and teamwork skills among students before and after the implementation of PBL [18].

### 4 Conclusion

The application of PBL teaching model to the liver and

biliary surgery probation course represents a significant advance in medical education. It fosters a student-centered learning environment that significantly improves students' clinical reasoning, problem solving, and teamwork skills. PBL model is problem-oriented, through problem presentation, independent learning, group discussion, report feedback, summary reflection and other links, to cultivate students' independent learning and collaboration ability. Implementing PBL in the hepatobiliary Surgery internship requires carefully designing interdisciplinary questions, guiding students to literature research, and integrating theoretical knowledge with clinical practice. The multi-dimensional evaluation method combining quantitative analysis and qualitative observation can comprehensively examine students' progress in all aspects. Introducing PBL teaching model into the course of liver and biliary surgery is helpful to cultivate students' self-learning ability, clinical thinking and teamwork spirit, which is of great significance for improving the quality of medical education and training high-quality medical talents.

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