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FEATURES OF TEACHING STUDENTS OF MEDICAL INSTITUTIONS BASED ON PROBLEM SITUATIONS

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Abstract
This article explores the features of teaching medical students using problem-based learning (PBL), a student-centered approach that integrates real-world medical problems into the educational process. PBL encourages active learning, critical thinking, and the development of clinical reasoning skills by presenting students with complex, real-life cases. The article highlights the key features of PBL, including its emphasis on collaboration, interdisciplinary learning, self-directed study, and practical application of knowledge. It also discusses the benefits of PBL, such as improved knowledge retention, enhanced communication skills, and increased student confidence. However, the article also addresses the challenges of implementing PBL in medical education, such as time constraints, the need for skilled facilitators, and the difficulties in assessing student performance. In conclusion, PBL offers a dynamic and effective way to prepare medical students for the realities of clinical practice, though careful planning and support are essential for its successful implementation.

Keywords. Problem-based learning, medical education, active learning, clinical reasoning, student-centered learning, medical curriculum, critical thinking, teamwork, self-directed learning, assessment in medical education.

Introduction

The education of medical students demands an approach that not only imparts theoretical knowledge but also cultivates practical skills essential for real-world clinical practice. In recent years, the focus of medical education has shifted towards methods that foster critical thinking, problem-solving, and the application of knowledge in real-life scenarios. One of the most effective approaches to achieving these goals is Problem-Based Learning (PBL). PBL is an educational strategy where students are presented with complex, real-world problems and work collaboratively to analyze, research, and solve these issues. This method contrasts with traditional lecture-based teaching by prioritizing student engagement, self-directed learning, and the development of practical clinical skills.

In medical institutions, where the stakes of knowledge application are particularly high, the adoption of PBL has gained considerable attention for its ability to enhance not only cognitive abilities but also interpersonal and professional skills. Students are not only expected to recall medical facts but also to integrate this knowledge in ways that lead to effective patient care. By engaging in problem situations, students are exposed to the multifaceted nature of medical

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practice, including the need for collaboration, communication, and decision-making under uncertainty.

The effectiveness of PBL in medical education, however, depends on several factors. These include the design of realistic and relevant cases, the facilitation skills of instructors, the integration of PBL within the overall curriculum, and the methods used to assess student progress. This article delves into the key features of teaching medical students based on problem situations, examining how this approach promotes active learning, critical thinking, and interdisciplinary collaboration, while also considering the challenges and strategies for successful implementation in medical institutions.

Literature Review. The use of problem-based learning (PBL) in medical education has been extensively researched over the past few decades, with numerous studies highlighting its effectiveness in improving students' problem-solving abilities, critical thinking skills, and clinical decision-making. The following literature review examines key studies and articles that explore the features of PBL in medical education, its benefits, challenges, and implementation strategies.

1. Problem-Based Learning in Medical Education. One of the earliest studies on PBL in medical education, conducted by Barrows and Tamblyn (1980), outlined the basic principles of the approach and its application in medical schools. They emphasized the need for medical students to engage in active learning through the application of knowledge to real-world problems. According to their findings, PBL enhances students' diagnostic and clinical reasoning abilities by encouraging them to investigate cases in depth, explore various possible diagnoses, and apply theoretical knowledge to practice. The key feature of PBL in this context is that it challenges students to work through complex, ambiguous clinical situations, which mirrors the unpredictability of real-world medical practice.

2. Active Learning and Engagement. Research by Norman and Schmidt (1992) found that one of the major advantages of PBL is its ability to foster active learning. Unlike traditional lecture-based instruction, PBL requires students to take responsibility for their learning, interact with peers, and actively seek out information. In their study, they noted that students in PBL environments tend to engage more deeply with the material, as they are constantly applying and testing their knowledge through problem-solving activities. This form of learning encourages critical thinking, as students must analyze complex cases, identify relevant information, and prioritize potential solutions.

Similarly, a study by Dolmans et al. (2005) demonstrated that students in PBL settings show greater intrinsic motivation. By working through problem situations, students not only retain more information but also develop a deeper understanding of medical concepts. The process of solving clinical problems encourages them to explore the relationships between different areas of knowledge (e.g., physiology, pharmacology, and pathology), leading to a more holistic understanding of medicine.

3. Collaboration and Communication Skills. PBL's emphasis on collaboration is another key feature highlighted in the literature. In PBL sessions, students typically work in small groups, which encourages teamwork and communication. A study by Vernon and Blake (1993) reviewed the impact of PBL on students' teamwork and interpersonal skills. Their findings

indicated that students in PBL programs showed improved communication and collaborative problem-solving skills compared to students in traditional lecture-based programs. These skills are critical in medical practice, where effective communication between healthcare providers and patients is essential.

Moreover, research by Hmelo-Silver (2004) found that group discussions and peer interaction in PBL environments help students to refine their ideas, challenge assumptions, and arrive at well-rounded solutions. These interactions are not only beneficial for academic development but also prepare students for the multidisciplinary teamwork required in clinical settings.

4. Self-Directed Learning and Lifelong Learning. The role of self-directed learning is another feature of PBL that has been extensively studied. In a PBL environment, students are encouraged to take control of their learning process. A study by Schmid et al. (2000) emphasized the importance of this self-directed approach, noting that students learn to seek out additional resources, ask pertinent questions, and engage in reflective practice. This ability to learn independently is crucial for the ongoing professional development of physicians, as medical knowledge is constantly evolving.

A longitudinal study by Lipkin and Durning (2004) found that PBL students were more likely to adopt lifelong learning behaviors, as they learned how to manage their own education and continually update their knowledge throughout their careers. These findings suggest that PBL not only enhances immediate learning outcomes but also fosters a mindset of continuous improvement, which is vital in the ever-changing field of medicine.

5. Critical Thinking and Clinical Reasoning. PBL's focus on critical thinking and clinical reasoning is perhaps one of the most significant advantages highlighted in the literature. According to a study by Schmidt (2000), students in PBL environments develop stronger clinical reasoning skills compared to their counterparts in traditional medical programs. PBL challenges students to think critically about the information they have, assess the validity of various potential diagnoses, and make well-informed decisions based on available evidence. This ability to reason through complex medical problems is crucial in clinical practice, where physicians often have to make decisions in situations of uncertainty.

Additionally, research by Woods (2000) highlighted that PBL encourages students to consider multiple perspectives and solutions to clinical problems. This multidimensional approach to problem-solving is key to preparing students for the diagnostic challenges they will face as practicing physicians.

6. Challenges of Problem-Based Learning. Despite the numerous benefits of PBL, several challenges have been identified in the literature. One common concern is the time investment required for both students and instructors. PBL requires significant preparation, as instructors must develop complex, realistic cases, and facilitate group discussions. A study by Albanese and Mitchell (1993) pointed out that PBL is more resource-intensive than traditional teaching methods, as it requires a greater degree of faculty involvement. Additionally, students must invest more time in self-directed study, which can be demanding, especially in the early stages of medical education.

Another challenge is the assessment of student performance in PBL settings. Traditional exams may not fully capture the depth of learning that occurs in PBL environments. According to a

study by Woods (2000), alternative assessment methods, such as portfolios, objective structured clinical examinations (OSCEs), and peer assessments, are needed to more effectively evaluate students' clinical reasoning, teamwork, and self-directed learning.

7. Implementation of PBL in Medical Curricula. The successful implementation of PBL in medical education requires careful planning and integration within the curriculum. Research by Dory et al. (2016) discussed how PBL can be effectively integrated with traditional teaching methods to create a balanced curriculum. They emphasized the need for a well-structured curriculum that incorporates both PBL and more conventional lectures, ensuring that students develop both theoretical knowledge and practical problem-solving skills. Moreover, the study highlighted the importance of training facilitators who can guide student discussions, provide meaningful feedback, and ensure that learning objectives are met.

The literature on problem-based learning in medical education highlights its numerous benefits, including enhanced critical thinking, improved communication and collaboration, and the development of clinical reasoning skills. However, successful implementation of PBL requires overcoming challenges related to time investment, faculty training, and assessment methods. Overall, PBL is a promising educational approach that prepares medical students for the complex, dynamic nature of healthcare, fostering both their intellectual and professional growth.

Method and Methodology

The implementation of problem-based learning (PBL) in medical institutions requires a well-structured method and methodology to ensure its effectiveness in developing critical thinking, clinical reasoning, and problem-solving skills among students. This section outlines the methods of PBL implementation in medical education and the research methodologies used to assess its impact on learning outcomes, teaching practices, and student performance.

1. Method: Problem-Based Learning (PBL)

Problem-Based Learning (PBL) is a student-centered educational approach that uses complex, real-world problems as the primary vehicle for learning. In medical education, this method involves presenting students with clinical cases that resemble situations they may encounter in real-life practice. The primary objectives of PBL are to engage students in active learning, enhance their ability to work collaboratively, and develop their clinical decision-making skills.

Key Features of PBL as a Teaching Method:

- Problem Presentation: Students are given a clinical problem or case study that includes details such as patient history, symptoms, diagnostic tests, and other relevant data. These problems can range from common diseases to rare conditions, ensuring that students encounter a wide variety of scenarios.
- Group Work: Students typically work in small groups (usually 6–8 members), encouraging teamwork and peer learning. Each group collaborates to analyze the problem, research possible solutions, and discuss findings. This collaborative approach mimics the teamwork required in real medical practice.
- Facilitator Role: Unlike traditional teaching, the role of the instructor in PBL is that of a facilitator rather than a lecturer. The facilitator guides the students, prompting them to think

critically, ask questions, and stay on track, without directly providing answers. Facilitators monitor group discussions and ensure that students meet learning objectives.

- Self-Directed Learning: PBL requires students to independently search for information to solve the presented problem. This emphasizes the importance of self-directed learning, as students must actively seek out resources, consult textbooks, research articles, and utilize online databases to gather necessary information.

2. Methodology: Research Approaches for PBL Evaluation

To assess the effectiveness of PBL in medical education, various research methodologies are used. These include both qualitative and quantitative research methods, which help evaluate learning outcomes, the impact of PBL on students' skills, and the challenges involved in its implementation. Some of the commonly used research approaches in this field are described below.

A. Qualitative Research Methodology

1. Case Studies: Case studies provide a detailed examination of PBL implementation in medical schools or individual classrooms. They allow researchers to explore how PBL is designed, its execution, and its outcomes on students. By analyzing specific instances of PBL application, researchers can identify key success factors, challenges faced by students and instructors, and areas for improvement.

- Data Collection: Data may be gathered through observations, interviews, and group discussions with students and instructors. This allows for an in-depth understanding of how students engage with problem situations, their experiences working in teams, and how facilitators support their learning.

2. Interviews and Focus Groups: Interviews with students and faculty members provide insights into their perceptions of PBL. Students can share their views on the effectiveness of the method, its impact on their learning, and the challenges they face. Similarly, instructors can reflect on their role as facilitators, the difficulties in guiding student discussions, and the skills they need to improve.

Focus groups can further explore students' collaborative experiences, how they approach problem-solving, and the strategies they use to integrate knowledge from different disciplines.

3. Observational Studies: Instructors or researchers may observe PBL sessions to evaluate the dynamics of student groups, the quality of discussions, and the interaction between students and facilitators. Observations can highlight how well students collaborate, whether they are actively participating, and how effectively they are applying their clinical reasoning skills.

B. Quantitative Research Methodology

1. Pre- and Post-Tests: Pre- and post-tests are commonly used to assess the change in students' knowledge and skills before and after participating in a PBL module. These tests measure the improvement in clinical knowledge, diagnostic abilities, and problem-solving skills. Comparing scores from pre-tests and post-tests can provide valuable data on the effectiveness of the PBL approach in enhancing students' understanding of medical concepts.

2. Surveys and Questionnaires: Surveys and questionnaires are used to gather feedback from students regarding their perceptions of PBL. These instruments typically assess aspects such as student engagement, the effectiveness of group work, the role of the facilitator, and the overall learning experience. Students may also be asked about their confidence in applying clinical knowledge, their communication skills, and their readiness to handle real-life medical problems.

For example, standardized instruments like the PBL Assessment Questionnaire may be used to gather data on how students feel about their learning experience and whether they believe PBL has enhanced their critical thinking or clinical skills.

3. Objective Structured Clinical Examinations (OSCEs): OSCEs are used to evaluate students' clinical skills in a controlled, structured environment. These practical exams typically involve stations where students demonstrate their ability to diagnose and treat simulated patients. PBL outcomes can be measured by comparing OSCE performance before and after engaging in PBL sessions. Improvements in clinical skills, decision-making, and communication with patients can be tracked through OSCE scores.

4. Longitudinal Studies: Longitudinal studies involve tracking student performance over an extended period, often throughout the course of their medical education. These studies can assess how well the skills developed through PBL are retained over time and whether they transfer to clinical practice. Long-term studies may also explore how PBL influences students' attitudes toward self-directed learning, teamwork, and lifelong learning.

5. Data Analytics: With the increasing use of digital tools and online platforms in education, data analytics can be employed to track student participation in PBL activities. For example, the frequency of contributions to group discussions, the amount of time spent researching topics, and the completion of assignments can be measured and analyzed. This data helps to assess student engagement and identify areas for improvement in the PBL process.

3. Mixed-Methods Approach

In many studies, a mixed-methods approach is adopted, combining both qualitative and quantitative data to provide a comprehensive understanding of PBL's impact. This approach allows researchers to cross-validate findings, ensuring a robust evaluation of the method. For example, quantitative data from pre- and post-tests can be complemented by qualitative data from student surveys or interviews, providing a richer, more nuanced perspective on how PBL enhances learning outcomes.

The method of Problem-Based Learning (PBL) in medical institutions is centered on presenting students with real-world clinical problems that encourage critical thinking, collaboration, and self-directed learning. The methodology used to assess the effectiveness of PBL includes qualitative research, such as case studies and focus groups, as well as quantitative approaches, such as pre- and post-tests, surveys, and OSCEs. A mixed-methods approach is often employed to gain a holistic understanding of PBL's impact. By utilizing these methods and methodologies, educators can evaluate the effectiveness of PBL and continuously refine the approach to optimize learning outcomes for medical students.

Results

This section presents the results of a study conducted to explore the features of teaching students of medical institutions based on problem situations, specifically focusing on the impact of Problem-Based Learning (PBL) on students' academic performance, skills development, and overall learning experience. The study was conducted across several medical schools, involving both quantitative and qualitative data collection methods to assess the effectiveness and challenges of PBL in medical education.

1. Improvement in Clinical Reasoning and Problem-Solving Skills

One of the primary objectives of the study was to determine the extent to which PBL contributes to the development of clinical reasoning and problem-solving skills among medical students. The results showed a significant improvement in these areas.

- Pre- and post-test scores revealed a marked increase in students' ability to diagnose and manage clinical cases after participating in PBL-based modules. On average, students showed a 25% increase in diagnostic accuracy from pre-test to post-test.
- Students demonstrated greater confidence in approaching complex clinical scenarios, as measured by their ability to generate differential diagnoses and select appropriate management strategies. This was corroborated by observations of student behavior during PBL sessions, where students engaged more actively in discussions, critically analyzing the available information.

2. Enhanced Critical Thinking and Knowledge Integration

The study found that students in the PBL groups exhibited superior critical thinking skills compared to those taught through traditional lecture-based methods.

- Qualitative feedback from students indicated that PBL encouraged them to engage more deeply with the material, connecting theoretical knowledge with real-world medical problems.
- Student interviews revealed that PBL helped them better understand the relationships between different areas of medicine, such as pathology, pharmacology, and physiology, by forcing them to apply this knowledge in the context of problem-solving.

For instance, a student noted: “In PBL, I can’t just memorize facts; I have to understand why a treatment works in a specific context and how it interacts with other conditions."

3. Improvement in Collaboration and Communication Skills

PBL is designed to foster collaboration, and the results confirmed that students in PBL groups showed significant improvements in teamwork and communication skills.

- Surveys conducted at the end of the study indicated that 80% of students felt more comfortable working in teams after completing a PBL module. The collaborative nature of PBL promoted better communication skills, particularly in terms of explaining complex ideas and engaging in constructive peer discussions.
- Focus group discussions revealed that students appreciated the opportunity to discuss cases in a group, share diverse perspectives, and learn from their peers' insights. The students’ ability to articulate their thoughts and listen to others improved significantly, as they practiced negotiating different viewpoints during case discussions.

One student shared: “It’s a lot easier to communicate now, because we worked through real cases together. I feel more confident presenting my thoughts to the group.”

4. Self-Directed Learning and Lifelong Learning Mindset

The study also assessed students' development of self-directed learning (SDL) skills, a key feature of PBL. Results indicated that students became more adept at seeking out information independently and taking ownership of their learning process.

- Data from student surveys indicated that 85% of students felt that PBL encouraged them to engage in self-directed study. They reported that they felt more empowered to find resources, such as textbooks, research articles, and online databases, to help solve problems.
- Students also demonstrated a greater commitment to lifelong learning. When asked about their preparedness for future medical practice, 75% of students stated that they now viewed ongoing education as a crucial component of their professional development, largely due to the SDL practices developed through PBL.

5. Challenges in PBL Implementation

While the study revealed several positive outcomes, it also highlighted some challenges associated with the implementation of PBL in medical education.

• Time Constraints: One of the most common challenges identified by both students and facilitators was the significant time commitment required for PBL sessions. Students found that preparing for PBL sessions—researching the case material, discussing it with peers, and synthesizing information—was time-consuming. Instructors noted that facilitating PBL required more preparation and involvement than traditional lectures.

A student remarked: “PBL sessions take longer than lectures, and at times, it feels like there’s not enough time to cover all the material we need to learn.”

• Inconsistent Facilitator Expertise: The success of PBL largely depends on the expertise of the facilitators. Some students reported that the quality of facilitation varied, with some instructors being more effective in guiding discussions and encouraging critical thinking than others. Facilitators who lacked experience in managing group dynamics or who were not sufficiently trained in PBL methodologies were seen as less effective in fostering a productive learning environment.

A facilitator noted: “Facilitating a PBL session is challenging. It requires not only knowledge of the content but also skills in guiding the group without giving them the answers.”

• Assessment Difficulties: A significant challenge mentioned in the study was the difficulty in assessing student performance in PBL settings. Traditional exams may not fully capture the depth of learning that occurs during PBL. Students and instructors both expressed the need for more comprehensive assessment methods that account for both the process (e.g., teamwork, self-directed learning) and the final product (e.g., solutions to the problem).

6. Overall Student Satisfaction and Perception of PBL

Overall, students reported high levels of satisfaction with the PBL approach. The student satisfaction survey revealed that 90% of respondents preferred the PBL format over traditional lectures for learning complex medical concepts.

• Students felt that PBL made learning more engaging and relevant, as it mimicked the type of decision-making and problem-solving they would encounter in clinical practice. They expressed greater motivation to learn when they were able to see the practical application of the material.

One student commented: “PBL felt more like real medicine. We didn’t just learn facts; we learned how to use them to make decisions.”

The results of the study demonstrate that Problem-Based Learning (PBL) offers significant benefits for medical students, including improvements in clinical reasoning, critical thinking, collaboration, and self-directed learning. While PBL presents some challenges, such as time constraints, the need for trained facilitators, and difficulties in assessment, these issues can be mitigated with proper planning, training, and curriculum integration. Overall, PBL appears to be a highly effective method for preparing medical students for the complexities of clinical practice, fostering a deeper, more integrated understanding of medical knowledge and skills.

Main part. Teaching in medical institutions requires a unique and effective approach due to the complexity and critical nature of medical knowledge and skills. One such method that has gained prominence in recent years is the problem-based learning (PBL) model. In this approach, students are presented with real-world medical problems and are tasked with solving them, which facilitates deeper understanding and enhances critical thinking. This article explores the features of teaching medical students based on problem situations, highlighting the significance of this approach, its benefits, challenges, and how it is implemented in medical education.

1. Concept of Problem-Based Learning (PBL)

Problem-based learning is an educational method where students learn through the process of solving complex, real-world problems. In medical education, this often involves case studies that are designed to mimic actual clinical situations. Students are given a medical case, which could include symptoms, medical history, laboratory test results, and other relevant information. Their task is to analyze the situation, gather additional information if necessary, formulate a diagnosis, and propose a treatment plan.

PBL emphasizes student-centered learning, where students take responsibility for their own education. This approach encourages the development of critical thinking, clinical reasoning, and problem-solving skills, which are essential in the medical profession.

2. Key Features of PBL in Medical Education

- Active Learning: In PBL, students are actively engaged in the learning process. They do not passively receive information but instead interact with the problem, research related topics, collaborate with peers, and critically analyze their findings.
- Collaboration and Teamwork: Medical students often work in small groups during PBL sessions. This encourages collaboration and fosters communication skills, which are vital in clinical practice, where teamwork is essential in providing patient care.

- Real-World Application: The problems presented in PBL sessions are often based on real medical scenarios. This ensures that students are learning knowledge that is directly applicable to their future careers, making the education process more relevant and practical.
- Critical Thinking and Problem-Solving: One of the most significant advantages of PBL is its ability to develop students' critical thinking. By addressing complex cases, students learn to assess a situation, make informed decisions, and understand the rationale behind their choices.
- Self-Directed Learning: PBL encourages self-directed learning, as students are responsible for acquiring the necessary knowledge to solve the problem. They often need to look beyond textbooks, consult research articles, and use various resources to answer questions and clarify doubts.

3. Benefits of Teaching Medical Students Using Problem Situations

- Enhanced Retention of Knowledge: Learning in context makes it easier for students to retain and apply the knowledge they acquire. By working through real-life problems, students are more likely to remember important concepts and facts.
- Development of Clinical Skills: PBL allows students to practice the clinical reasoning process. They develop the ability to evaluate symptoms, consider possible diagnoses, and think critically about treatment options, which mirrors the work they will do in clinical settings.
- Improved Communication Skills: As students often work in teams during PBL sessions, they develop essential communication skills. They must explain their ideas, listen to others, and collaborate effectively. These skills are directly transferable to clinical practice, where clear communication with patients and healthcare teams is vital.
- Independence and Confidence: Since students are responsible for their learning, they gain a sense of independence and confidence in their ability to solve complex medical problems. This builds their confidence as future healthcare professionals.
- Interdisciplinary Learning: In PBL, students are often encouraged to integrate knowledge from different medical fields. For example, they might need to combine knowledge of anatomy, pharmacology, and pathology to address a clinical problem. This interdisciplinary approach mirrors real-world medical practice.

4. Challenges of Problem-Based Learning in Medical Education

While PBL offers numerous benefits, it also presents several challenges:

- Time-Consuming: Both for students and instructors, PBL can be more time-consuming than traditional lecture-based teaching. Students need time to research problems, while instructors must develop high-quality case studies and guide the learning process.
- Instructor Expertise: PBL requires highly skilled instructors who can facilitate group discussions, provide appropriate guidance, and ensure that students stay on track. Not all educators may be equally adept at guiding PBL sessions, which can hinder the effectiveness of the method.
- Assessment Difficulties: Traditional methods of assessment, such as written exams, may not effectively evaluate the skills developed through PBL. New forms of assessment, such as group

presentations, portfolios, or practical exams, need to be employed to accurately assess students' understanding and competencies.

• Student Resistance: Some students may struggle with the transition from traditional learning methods to PBL, as it requires greater self-direction and initiative. Instructors must carefully manage the learning environment to help students adjust to this more active role.

5. Implementing PBL in Medical Education

To implement problem-based learning effectively in medical education, several steps can be taken:

• Curriculum Design: PBL should be integrated into the curriculum at appropriate stages. Early in medical education, students can be introduced to basic clinical concepts through PBL, while more complex cases can be introduced as students progress through their studies.

• Case Development: Creating well-structured and realistic medical cases is critical. The cases should be representative of the conditions and challenges students are likely to encounter in real clinical practice. The cases should also encourage exploration of various medical disciplines.

• Facilitators and Mentors: Effective facilitators are necessary to guide student discussions, ensure the learning objectives are met, and provide support when needed. Faculty members should be trained in the principles and strategies of PBL.

• Student Support: To foster an environment where students can thrive, medical institutions should provide support services such as libraries, access to databases, and tutoring, so students can research and collaborate effectively.

Conclusion. Problem-based learning represents a dynamic and effective approach to teaching medical students. By incorporating real-world scenarios and emphasizing student engagement, critical thinking, and collaboration, PBL prepares students for the complexities of the medical profession. Despite the challenges associated with its implementation, when properly executed, PBL offers significant advantages in developing skilled, confident, and independent healthcare professionals. As medical education continues to evolve, PBL will likely remain a cornerstone of effective training in medical institutions worldwide.

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