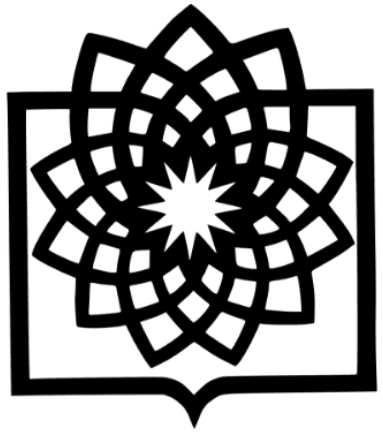

دانشگاه علوم پزشکی شهید بهشتی

جمهوری اسلامی ایران
وزارت آموزش و پرورش

Problem-Based Learning (PBL)

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Introduction

- Teaching in health professions is not limited to transferring facts; learners must also develop reasoning, communication, teamwork and the ability to apply knowledge in clinical situations.
- Traditional lectures can efficiently introduce large amounts of content, but active learning methods provide additional opportunities for students to analyze problems and justify decisions.
- PBL changes the starting point from 'What information should the teacher give?' to 'What problem must the learner understand and solve'؟
- The problem therefore becomes a stimulus for discussion, self-directed study and integration of knowledge.

Concept and Definition of PBL

- PBL is an instructional method in which students learn through working on realistic problems rather than receiving all relevant information in advance.
- The problem is used as a stimulus for acquiring the knowledge, skills and abilities required to understand and address the situation.
- The process begins with a problem, question or puzzle that the learner needs to investigate and resolve.
- PBL is commonly characterized by active student participation, collaborative learning, self-directed study and facilitation rather than direct instruction.

The Core PBL Idea

- The learning cycle begins with a problem and moves through ideas, prior knowledge, learning issues, action and evaluation.
- Students first consider what they already know and use that knowledge to identify important questions.
- The learning issues guide independent study and determine what information the group needs to investigate.
- New information is then brought back to the group, discussed, integrated and applied to the original problem.
- Evaluation asks both whether the problem was addressed and how effectively the group completed the learning process.

Goals of Problem-Based Learning

- Develop a broad and flexible knowledge base that can be applied to unfamiliar situations.
- Improve understanding and retention by learning in a meaningful context rather than memorizing isolated facts.
- Develop effective problem-solving abilities and encourage learners to justify decisions using evidence.
- Promote self-directed and lifelong learning so that students can continue learning after formal education.
- Strengthen collaboration, communication and shared responsibility within small groups.

Aims of PBL

- Problem solving: learners analyze a situation, identify the central problem and work toward a defensible solution.
- Self-directed learning: learners identify knowledge gaps and independently search for information needed to close those gaps.
- Small-group learning: learners discuss, question, explain and refine ideas with peers.
- Critical thinking: learners compare evidence, challenge assumptions and justify conclusions.
- Curriculum integration: learners connect knowledge from different disciplines instead of studying each topic in isolation.

Characteristics of PBL

- Learning is driven by challenging and open-ended problems that stimulate inquiry and problem-solving.
- Learning is student-centered: students have an active role in deciding what they need to know and how to investigate it.
- Students usually work in small collaborative groups, with shared responsibility for discussion and learning.
- The teacher acts as a facilitator or guide and does not function simply as the main source of answers.
- New information is acquired through self-directed learning and is then brought back to the group for integration.

Principles of PBL

1. Development of analytical and creative thinking through interpretation of realistic problems.
2. Encouragement of cooperative learning and productive interaction between group members.
3. Development of self-directed learning activity and responsibility for identifying learning needs.
4. Application of knowledge and skills through practice and problem resolution.
5. Learning is strengthened when new knowledge is connected to prior knowledge and a meaningful context.

Components of PBL

- A non-lecture format in which the teacher primarily facilitates rather than continuously presents information.
- A realistic situation or problem that builds on previous learning and creates a need for further investigation.
- Student group work, discussion, questioning and sharing of prior knowledge.
- Student-directed investigation in which learners identify resources and pursue learning issues.
- A final process of integrating new information, proposing a solution and evaluating both the product and the group process.

Preparation and Conduct of PBL

- Ideas: consider the problem and generate initial interpretations or possible explanations.
- Known facts: define what is already known and separate established information from assumptions.
- Learning issues: identify the missing knowledge, skills or evidence required to understand the problem.
- Action plan: decide what will be investigated, which resources will be used and how responsibilities will be shared.
- Evaluation: assess whether the problem was addressed and whether the learning process was effective.

Steps of the PBL Process

1. Present the problem and make the clinical or educational situation clear to the group.
2. Organize ideas and prior knowledge: What do we already know?
3. Pose questions: What do we need to know or clarify?
4. Assign responsibility for learning questions and identify appropriate resources.
5. Research, summarize and analyze findings, then reconvene to report the results. Integrate new information, refine questions, reach a resolution and evaluate how the group performed.

Cognitive Effects of PBL

- Initial analysis of the problem activates prior knowledge that may be relevant to the new situation.
- Group discussion encourages elaboration of prior knowledge and active processing of new information.
- New information can restructure and expand the learner's existing knowledge framework.
- Knowledge is constructed socially through explanation, questioning, comparison and discussion with peers.
- Learning occurs in context, and a relevant problem can stimulate curiosity and motivation to understand the topic.

Learning Opportunities Provided by PBL

- Students can examine and test what they already know rather than assuming that prior knowledge is complete.
- They discover specific learning needs instead of receiving a predetermined list of facts.
- They develop interpersonal skills needed for effective teamwork and collaborative performance.
- They improve communication by explaining ideas, presenting findings and responding to questions.
- They learn to defend positions with evidence and sound reasoning and practice skills needed beyond formal education.

Role of the Student

- Participate actively in group discussion and contribute relevant prior knowledge without dominating the group.
- Identify knowledge gaps, formulate learning questions and take responsibility for assigned learning tasks.
- Search for relevant and credible information, summarize findings and distinguish evidence from unsupported assumptions.
- Explain findings to peers, listen to alternative interpretations and help integrate different sources of information.
- Contribute to the final solution and reflect on both the learning outcome and the effectiveness of the group process.

Role of the Facilitator

- Guide the group toward reflective thinking and encourage students to ask open and purposeful questions.
- Help learners clarify what they understand, what remains uncertain and why particular decisions were made.
- Maintain productive group dynamics, encourage participation and prevent one or two members from dominating the discussion.
- Keep the group aligned with appropriate curriculum objectives while avoiding unnecessary direct provision of answers.
- Check understanding, support synthesis of findings and help the group evaluate the quality of its learning process.

PBL in Anesthesia Education

- Anesthesia is well suited to problem-oriented learning because clinical decisions require integration of physiology, pharmacology, airway management, monitoring and communication.
- A realistic perioperative or emergency problem can be used to trigger discussion before all relevant information is provided.
- Learners can identify what is known, what is missing and which concepts must be reviewed before proposing a management approach.
- The facilitator can guide the group toward learning objectives while preserving the student's responsibility for investigation and reasoning.
- PBL should complement, not automatically replace, lectures, simulation, demonstrations and supervised clinical teaching.

Clinical Trigger: Difficult Airway

- Scenario: A patient is scheduled for surgery and the preoperative assessment suggests a potentially difficult airway.
- Initial questions: What information is already available? What additional assessment or preparation is needed? What are the major risks?
- Learning issues may include airway assessment, oxygenation, equipment preparation, induction considerations, rescue strategies and team communication.
- Students independently investigate the learning issues, return to the group, compare evidence and develop a structured plan.
- The group then evaluates the plan and reflects on whether the original problem was adequately addressed.

Why PBL Can Be Valuable in Anesthesia

- It encourages learners to connect basic science with clinical situations instead of treating knowledge as isolated facts.
- It provides repeated practice in identifying relevant information, prioritizing problems and explaining the rationale for decisions.
- Small-group discussion can expose learners to different interpretations and promote communication and teamwork.
- Self-directed study encourages postgraduate learners to identify and fill their own knowledge gaps.
- The approach can therefore support clinical reasoning, although patient care decisions must always follow current clinical guidance and supervision.

Advantages of PBL

- Promotes student-centered learning and increases the learner's active role in the educational process.
- Creates interest and motivation by giving students a meaningful reason to search for information.
- Helps learners apply knowledge to practice and develop complex problem-solving and clinical reasoning abilities.
- Encourages self-learning, collaboration, communication, presentation skills and lifelong learning.
- Can make learning more meaningful and memorable because knowledge is acquired in context.

Limitations and Challenges

- A well-designed PBL case can be time-consuming to develop and requires coordinated effort from the teaching team.
- Facilitators need preparation and training; being a subject expert does not automatically mean being an effective PBL facilitator.
- PBL may require more contact time and may cover specific content less predictably than a conventional lecture.
- Designing multidisciplinary problems requires careful organization, curriculum alignment and appropriate learning resources.
- Group assessment can be difficult because individual contribution, teamwork and learning outcomes all need fair and clear criteria.

Assessment in PBL

- ✓ Assessment should address both the learning outcome and the learning process, rather than measuring recall alone.
- ✓ Relevant domains may include knowledge, problem solving, clinical reasoning, communication, teamwork and self-directed learning.
- ✓ When group work is assessed, criteria should make individual responsibilities and expected contributions explicit.
- ✓ Feedback should identify strengths, learning gaps and specific opportunities for improvement.
- ✓ Evaluation should ask both: 'Did the group reach an appropriate solution?' and 'How effectively did the group learn and work together'?

Implications for Postgraduate Anesthesia Education

- Cases should be aligned with explicit learning objectives and should be complex enough to require reasoning without being so vague that learners cannot identify a useful direction.
- The case should encourage integration of relevant anesthesia knowledge rather than testing one isolated fact.
- Facilitators should support inquiry, evidence use and reflection while avoiding premature closure of the discussion.
- PBL is most useful when integrated with other educational strategies, especially where learners also need direct skills practice, simulation or concise content teaching.
- The educational goal is not simply to produce an answer, but to develop a reproducible process for approaching unfamiliar clinical problems.

Conclusion

- Problem-Based Learning starts with a meaningful problem and uses that problem to drive inquiry, self-directed study, group discussion and application of knowledge.
- Its central features include student-centered learning, small-group collaboration, facilitator guidance and integration of new information into a solution.
- PBL can support problem solving, critical thinking, communication, teamwork and lifelong learning, particularly when cases are relevant to professional practice.
- For anesthesia postgraduate education, carefully designed clinical triggers can connect scientific knowledge with clinical reasoning and decision-making.
- Effective PBL requires good case design, trained facilitation, adequate time, appropriate assessment and integration with the wider curriculum.

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8. The above references are peer-reviewed publications; the slide content is also aligned with the PBL charts and teaching-method materials supplied for this assignment.

Thank You