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DEVELOPING LEARNERS' THINKING SKILLS THROUGH PROBLEM-BASED LEARNING

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ABSTRACT

The above summary provides an overview of the problem-based learning approach within the context of higher education reform, emphasizing a learner-centered orientation. Problem-based learning is introduced as a modern teaching trend that originated at McMaster University in the late 1960s and quickly spread worldwide. Although it has been in existence for decades, this method remains highly relevant and continues to attract academic research interest, as evidenced by international symposiums held in the United States and Singapore. This highlights that PBL is not only a teaching method but also a significant topic of educational research. In the context of Vietnam's higher education aiming for pedagogical innovation, the article emphasizes the introduction of problem-based learning as a potential solution, while analyzing the necessity and feasibility of its application in Vietnam. In particular, the initial experiences at Nha Trang University are presented as practical evidence, contributing to affirming the value of this method in the domestic educational environment. In summary, this section provides a general overview and establishes a foundation for the detailed analyses presented in the article.

KEYWORDS: problem-based learning, PBL, critical thinking, self-study skills, higher education, students.

1. INTRODUCTION

In the context of globalization and the rapid development of science and technology, the demand for quality training in higher education is increasingly high, especially regarding the cultivation of individuals with independent thinking, problem-solving abilities, and adaptability to constantly changing work environments. In response to these demands, the innovation of teaching methods has become essential, with Problem-Based Learning (PBL) emerging as a modern and effective trend [1].

PBL originated at McMaster University (Canada) in the late 1960s, initially applied in the field of medicine, but quickly expanded to various disciplines and countries. At its core, PBL presents students with real-world situations or problems to solve collaboratively, enabling them to actively explore knowledge, develop critical and systemic thinking, as well as teamwork skills. Instead of approaching lessons from theory to practice, PBL allows students to start from real-world contexts, identify the necessary knowledge themselves, conduct independent research, and draw conclusions through cooperative learning processes [2].

PBL not only transforms the teacher's role from a "knowledge transmitter" to a "facilitator," but also places learners at the center of the knowledge acquisition process. This aligns closely with the current demands for educational reform, where self-study abilities, independent research skills, and problem-solving competencies are regarded as core attributes of modern learners. PBL fosters active learning processes, encouraging students to develop their thinking through practical activities, group discussions, and peer critiques, thereby enabling knowledge to be not only acquired but also recreated and flexibly applied in various contexts [3].

The Problem-Based Learning (PBL) method emerged and has been widely adopted in many universities around the world based on the following arguments:

- The explosive development of science and technology in recent decades has made it impossible to teach learners everything they need to know.
- Knowledge acquired in school is often outdated or not closely aligned with real-world professional practice after graduation; therefore, it is essential to integrate current, real-world issues into teaching.
- It is necessary to actively engage learners in the knowledge acquisition process to make learning more effective and sustainable [4].

Observations on higher education in the fields of

agricultural sciences, information technology, electrical-electronic-telecommunications engineering, and physics at several universities in Vietnam were conducted starting in 2006 under the sponsorship of the Vietnam Education Foundation (VEF) and with the collaboration and support of the Ministry of Education and Training as well as several domestic organizations, universities, and research institutes.

Leading U.S. experts in instructional design and evaluation, along with specialists in selected academic disciplines, participated in this project.

The project's purpose was to support leaders and administrators of higher education institutions in their efforts to improve curricula, teaching methodologies, and to provide assessments of the training and scientific research activities in science and engineering fields in Vietnam.

After completing field surveys in May 2006, the team of U.S. experts provided the following observations regarding the state of teaching and learning at Vietnamese universities:

- "Education in agricultural sciences, and more broadly in other fields of study, relies too heavily on rote learning and lacks integration of modern learning methods that emphasize student learning outcomes." [5]
- "Teaching methods are ineffective: lectures, presentations, mechanical memorization, limited homework assignments, and little interaction between students and instructors." [6]
- "There is a lack of emphasis on developing general and professional skills such as teamwork, communication or writing in English, project management, problem-solving methods, initiative, lifelong learning, etc." [6]

Based on these observations, the team of U.S. experts recommended:

- "Providing students with more experiential and applied practice through lab exercises, project design and implementation, and learning through problem-solving." [6].

1.1. Feasibility of Applying the PBL Method in Vietnam

In order to effectively implement PBL, several key factors are required: the competence of the teaching staff, the availability of teaching and learning resources, and appropriate classroom organization conditions.

- **Regarding the competence of the teaching staff:** The teaching staff must be sufficient in number to assign instructors to various student

groups, and they must possess both practical professional knowledge and pedagogical skills to design course-specific problems. In the current context of higher education in Vietnam, universities are generally facing an imbalance between the number of lecturers and the number of students. Therefore, it is necessary to adopt comprehensive solutions such as increasing the number of lecturers (both full-time and visiting), merging classes for general theoretical lectures, and utilizing teaching assistants (including young lecturers and doctoral candidates) to guide student groups.

- **Regarding teaching and learning resources:** Lecturers and students must be facilitated in accessing diverse resources, including materials not readily available in libraries or online (e.g., medical records, internal reports, court hearing transcripts, etc.) to design problems and explore related content. With the rapid development of information sources and the internet system in Vietnam, both lecturers and students are, in general, capable of finding suitable materials for applying this teaching method.
- **Regarding classroom organization conditions:** PBL tends to be more effective in classes with smaller sizes and adequate physical conditions to support group activities. Given that university classes in Vietnam often have large student numbers, reasonable teaching organization is necessary, as discussed above (merging classes for general theoretical lectures and using teaching assistants to guide student groups). Additionally, appropriate spaces are needed for student groups to work collaboratively.

1.2. Some Initial Results at Vinh Long University of Technology Education

Initial implementation at Vinh Long University of Technology Education has demonstrated the potential of PBL in promoting the shift toward learner-centered teaching methods. In recent years, the university has made initial investments, such as organizing training courses for lecturers on teaching method innovation, with special emphasis on PBL, and investing (through a ministerial-level scientific research project) in developing a problem bank for certain training disciplines. Furthermore, lecturer evaluation criteria have been revised to emphasize the effectiveness of teaching method innovation.

This article aims to analyze the role of PBL in

developing learners' thinking skills, from a theoretical perspective to practical application. It particularly focuses on the feasibility of applying PBL in the current context of Vietnamese higher education by analyzing some initial implementation results at Vinh Long University of Technology Education, thereby suggesting directions for further development of this method in the future.

2. RESEARCH METHODS

This study employs the methods of synthesizing and analyzing research literature and international reports related to PBL. The author collected and selectively reviewed reputable sources to build a solid theoretical foundation for the research. In addition, the study analyzes a practical case of PBL implementation at Vinh Long University of Technology Education. Qualitative data were collected through student surveys regarding their learning experiences with PBL. Furthermore, internal scientific reports from the university were used to supplement practical evidence. The content analysis method was applied to process the survey data. The results were then synthesized to draw observations and assess the effectiveness of the PBL model. Conclusions were cross-referenced with theoretical frameworks to enhance the study's reliability.

3. RESULTS AND DISCUSSION

3.1. Theoretical Foundations

1. Definitions of PBL

Although definitions of PBL vary in wording and perspective, they share a common core: organizing learning activities around real-world problems.

- According to the first definition, PBL is a learning activity that takes place within a practical context, aiming to equip learners with problem-solving skills, enhance their self-directed learning abilities, and develop teamwork capabilities. Here, the method emphasizes not only knowledge transmission but also personal capacity development.
- The second definition describes PBL as a learning method in which carefully selected real-world problems form the foundation of the curriculum. This perspective highlights the practicality and high applicability of the learning content.
- The third definition emphasizes PBL as a comprehensive educational approach, applied both at the curriculum level (selecting systematically significant problems) and at the learning process level (learning as a way of

solving real-life challenges). Through this, learners approach knowledge critically while simultaneously developing essential soft skills.

- The fourth definition views PBL as a teaching method where students access knowledge and skills through a learning process designed around questions, problems, and real-world tasks. This interpretation stresses the pedagogical design process and the instructor's guidance role.

In summary, all definitions agree on placing the problem at the center, promoting learner autonomy, and aiming to develop comprehensive competencies rather than merely acquiring theoretical knowledge.

3.2. Objectives of Problem-Based Learning

PBL aims at three major groups of objectives: cognitive, skills-based, and attitudinal.

a) Cognitive Objectives

The method enables learners to acquire knowledge in both breadth and depth, as they independently select relevant content to research and solve problems. Learning is linked to the real-world needs for understanding, making knowledge more meaningful and memorable.

b) Skills Objectives

PBL fosters the development of skills such as document comprehension, scientific research, problem-solving, as well as social skills like teamwork, presentation, debate, negotiation, and more. Learners experience the entire process—from information gathering, collaborative problem-solving, to presenting results—all of which are practical skill-building activities.

c) Attitudinal Objectives

Learners will feel more connected to and enjoy the subject, recognizing the value of cooperative learning. Gradually, they develop a positive, proactive attitude toward learning—an important foundation for building lifelong learning autonomy.

3.3 Characteristics of the PBL Method

a. The problem serves as the central context for teaching and learning activities

Unlike traditional methods (where knowledge is provided first and problems are solved later), PBL introduces the problem right at the beginning. The problem is often a real-world situation with elements of uncertainty, sparking curiosity and requiring learners to engage in analytical thinking to clarify the issue.

This approach encourages learners to construct knowledge through experience rather than passively receiving information. It represents a shift from "learning to know" to "learning to solve problems."

b. Learners actively seek out sources of information to solve the problem

Learners must proactively search for and evaluate information from various sources—books, newspapers, the internet, videos, etc. This process helps them develop critical thinking skills, information evaluation abilities, and filtering skills. At the same time, they essentially build their own theoretical foundation to analyze, justify, or refute proposed hypotheses.

c. Group discussion is a core activity

Although the method can be implemented individually, its highest effectiveness often comes from small group discussions. In these groups, learners share information, propose hypotheses, critique each other's ideas, and collaboratively build solutions.

This process not only hones their professional skills but also fosters the development of collaboration, communication, and the ability to work in a multi-perspective environment.

d. The teacher's role is supportive

The teacher is no longer a mere transmitter of knowledge in the traditional "lecture-note" format but acts as a facilitator and advisor. The teacher introduces the problem, guides the approach, supports information seeking, evaluates proposed solutions, and helps generalize the knowledge gained.

In this method, teachers must be capable of designing effective learning situations and must be sensitive in monitoring learners' progress in order to intervene at the right time and in the right way.

3.4 Problem Classification

a. Classification of Problem Types in Problem-Based Learning (PBL)

Classifying problems in PBL into five types, from Type I to Type V, represents a systematic approach that helps both teachers (T) and learners (L) accurately identify the nature of each learning situation. Each type reflects different levels of cognition and proactivity from both teachers and learners during the process of knowledge discovery.

1. Type I: Problems familiar to both T and L in terms of content, method, and solution

- **Characteristics:** Both T and L are fully aware of

all three aspects: content, solving method, and answer.

- **Purpose:** To review and reinforce previously learned knowledge.
- **Example:** Solving a quadratic equation.
- **Analysis:** This type is more evaluative than exploratory. Although it does not generate new knowledge, it plays a crucial role in initial assessments or in concluding a topic.

b. Type II: L knows the content but not the solving method – T knows the solution

- **Characteristics:** T can orient the solution; L must think independently to propose a personal approach.
- **Example:** Proposing energy-saving solutions for an organization.
- **Analysis:** This type helps develop independent thinking as learners begin to apply their knowledge to real-world situations. Learners act as explorers, while teachers provide guidance.

c. Type III: Both T and L know the content; T may not fully know the method or solution

- **Characteristics:** Open-ended; multiple approaches are possible, and the result is not fixed.
- **Example:** Creating an equation using the numbers 2, 3, and 5.
- **Analysis:** This type fosters creativity, allowing learners to express novel ideas. Teachers act as facilitators, encouraging exploration.

d. Type IV: Both T and L know the content, but neither knows the method nor the solution

- **Characteristics:** Unfamiliar situations that challenge thinking.
- **Example:** How to make a soccer ball sink in water?
- **Analysis:** This type stimulates curiosity and demands critical thinking and interdisciplinary knowledge. The absence of a clear solution encourages learners to engage actively in discovery with support from the teacher.

e. Type V: Neither T nor L knows the content, method, or solution

- **Characteristics:** Research-oriented, future-focused.
- **Example:** Identifying the three biggest challenges facing a nation.

- **Analysis:** This is the highest level in PBL, promoting creativity and independent research skills. Learners approach the problem like scientists, with teachers acting more as companions rather than knowledge transmitters.

3.5 Advantages of the PBL Method

PBL is not merely a tool for knowledge transmission but a strategy for the comprehensive development of learners' competencies. The following advantages explain why this method is increasingly favored in modern education.

a. Enhancing learner autonomy and engagement

- Stimulates curiosity and a thirst for knowledge, encouraging learners to actively acquire knowledge.
- Shifts the central role from teacher to learner, aligning with modern educational philosophies.

b. Developing soft skills and lifelong learning abilities

- Through problem-solving activities, learners develop skills such as reading academic materials, teamwork, presentation, debate, and critical thinking.
- These skills not only support current learning but also serve as long-term professional assets.

c. Connecting theory with practice

- Mitigates the common issue of learning detached from reality in higher education.
- Enables learners to better understand how to apply specialized knowledge in real-world contexts.

d. Deepening and sustaining knowledge retention

- The active search for and application of knowledge leads to deeper understanding and longer retention.
- Reduces the tendency toward rote learning and studying merely for exams.

e. Promoting teachers' professional development

- Teachers must enhance their skills in problem design, discussion management, and flexible handling of pedagogical situations.
- Motivates teachers to innovate teaching methods, engage in lifelong learning, and

positively develop their pedagogical competencies.

3.6 Disadvantages of the Problem-Based Learning Method

Despite its numerous outstanding advantages, PBL still has certain limitations, mainly arising from practical conditions and the nature of specific subjects.

a. Limitations with abstract subjects

- Subjects like theoretical mathematics or political theory are challenging to frame into practical, easily visualized problems.
- Learners may become confused without clear guidance.

b. Difficulties in large class settings

- More small groups mean a greater organizational workload, leading to potential teacher overload.
- Teaching assistants or technological support are necessary to effectively monitor group discussions.
- Managing time and ensuring effective participation across all groups pose significant challenges.

PBL represents a positive, innovative approach that emphasizes the learner's role and fosters comprehensive competency development. Classifying different types of problems helps teachers select content that suits the lesson objectives and learners' characteristics. However, effective implementation of PBL requires investment in professional expertise, classroom management skills, and facilities.

In the context of modern education aiming to develop learner competencies, particularly in higher education, PBL serves as an essential tool for shifting from "teaching what is available" to "guiding how to learn and solve problems." Therefore, teacher training programs, instructional materials, and technological platforms are needed to maximize the effectiveness of PBL in Vietnam's educational practice.

3.7 Analysis of Achieved Results

a. Development of Critical Thinking (51.1%)

The fact that more than half of the students believe they have developed critical thinking is a positive sign. In PBL, students are not passively receiving knowledge but are placed in situations with problems that need to be solved. This forces them to analyze, evaluate information, and argue to come up with solutions, thereby developing their critical

thinking skills—an essential ability in university learning and life.

- Significance: The results show that PBL creates a learning environment that forces students to think actively, ask questions, and check assumptions—key characteristics of critical thinking.
- Causes of Achievement: Thanks to the structure of PBL—problem-centered and without ready-made knowledge—students are forced to think for themselves, compare, critique, and discuss different viewpoints.
- Implications: Designing lessons with open, practical problems that have no "single answer" plays a crucial role in stimulating critical thinking.

b. Expanding Knowledge (66.1%)

The majority of students feel they have expanded their knowledge through PBL. This demonstrates the method's ability to support deep learning.

- Significance: PBL not only helps students absorb knowledge in the curriculum but also leads to the expansion of their understanding through other learning resources.
- Causes of Achievement: Because students must search for materials, comprehend, evaluate, and connect information to solve problems, they have the opportunity to access diverse knowledge, thus expanding their understanding.
- Implications: Instructors should design interdisciplinary and cross-disciplinary situations to encourage students to connect and broaden their knowledge.

c. Improvement of Teamwork, Presentation, and Communication Skills

These are important soft skills in modern work environments. PBL provides opportunities for students to practice and develop these abilities through collaborative learning activities.

Significance: The PBL method not only focuses on specialized knowledge but also helps students develop essential social skills for their future careers.

Causes of Achievement: Group work is a core part of PBL—where students must coordinate to divide tasks, share ideas, provide feedback to one another, and present results together.

Implications: Designing collaborative tasks with clear roles and requirements for presenting to the group/class will help develop soft skills more effectively.

2. Analysis of Difficulties

a. Difficulties in Large Classes Implementing PBL in large classes is a significant challenge.

- Causes: With a large number of students, it is difficult for instructors to provide in-depth support for each group. Organizing group discussions, presentations, and critiques can also become chaotic and ineffective.
- Impact: It reduces the quality of interaction between instructors and students, as well as between student groups. It also makes it difficult to evaluate both the process and the learning outcomes.
- Solution: The class can be divided into smaller groups, utilizing teaching assistants, and using technology (such as online classrooms, discussion forums) to manage the groups more effectively.

b. Difficulties with Abstract Subjects Some subjects are highly theoretical and have little practical application (referred to as “abstract subjects”), making it challenging to implement PBL.

- Causes: Creating problem-based scenarios in abstract subjects requires creativity and significant time and effort from the instructor. Students also find it difficult to relate theoretical knowledge to real-life situations.
- Impact: If the problem is not connected to students' experiences or real-world contexts, they may feel confused and lack motivation to participate.
- Solution: It is necessary to develop “simulated problems” that are practical or linked to engaging hypothetical scenarios; visual tools such as simulations, videos, or real-life situations could be integrated.

c. Instructor Competency and Quantity Implementing PBL requires instructors who not only have strong subject knowledge but also possess the skills to organize, lead, and flexibly support students.

- Challenge: If instructors have not been adequately trained, or if the number of instructors does not match the size of the class, the effectiveness of PBL will decrease significantly.
- Solution: There should be training programs for instructors on the PBL method, as well as increased technical support and teaching assistant teams.

d. Limitations in Learning Materials and Classroom Conditions For students to engage in self-learning and seek out materials, a rich, easily accessible, and suitable learning resource is essential. In addition, flexible learning spaces are a critical factor in facilitating group work.

- Difficulties: The lack of digital learning resources and traditional facilities (fixed tables,

classrooms that cannot be divided) hinders group discussions and presentations.

- Solution: The school needs to invest in learning resources (digital libraries, online databases) and improve physical conditions (multifunctional classrooms, open spaces).

4. OVERALL ASSESSMENT AND RECOMMENDATIONS

a. Overall Assessment

Through the survey and analysis process, the research findings confirm that PBL has a positive impact on the comprehensive development of students, in terms of cognition, skills, and learning attitudes. PBL helps students not only master specialized knowledge but also develop essential skills such as critical thinking, problem-solving, communication, and teamwork. The open, real-world learning scenarios in PBL encourage students to actively explore, research, and build new knowledge rather than passively absorb information. As a result, students' self-learning abilities, creativity, and adaptability are significantly improved.

However, the effectiveness of implementing PBL largely depends on factors such as infrastructure conditions, class size, the level and readiness of the teaching staff, as well as the degree of student initiative. Some challenges encountered include: large class sizes making it difficult to organize group activities; instructors being limited in experience in designing scenarios and coordinating the learning process; students being unfamiliar with active learning methods, having passive mindsets, and being reluctant to speak or collaborate in groups. In addition, the lack of resources to support PBL is also a significant barrier.

In general, PBL is an advanced method that aligns with the current educational reform demands. To maximize the effectiveness of PBL in the university environment, comprehensive adjustments in policies, teaching organization, and capacity building for both instructors and students are required.

b. Recommendations

- **For the institution:**
 - ❖ Develop and implement policies to support the implementation of PBL, such as adjusting class sizes to an appropriate level to ensure effective group activities.
 - ❖ Invest in upgrading learning facilities such as multipurpose classrooms, presentation equipment, electronic libraries, and open learning resource systems for document

retrieval.

- ❖ Organize regular training courses to enhance professional competencies, scenario design skills, and group coordination techniques for instructors.
- ❖ Encourage and support research and experience-sharing on PBL implementation within the institution and among educational establishments.
- **For instructors:**
 - ❖ Receive specialized training in the theory and practical implementation of PBL, especially in creating real-life learning scenarios that align with course content.
 - ❖ Be proactive in researching and creating active learning activities, designing learning tasks suited to different student groups.
 - ❖ Develop group coordination skills, manage the learning process, encourage students to self-explore, and provide timely support when necessary.
 - ❖ Practice flexible and fair assessment of both the learning process and products, with a focus on student-centered approaches.
- **For students:**
 - ❖ Be clearly oriented on the PBL learning method from the beginning of the course, emphasizing the active role of the learner in information gathering, processing, and problem-solving.
 - ❖ Strengthen skills in searching for, analyzing, and synthesizing information from various sources; develop critical thinking, and the ability to propose arguments and creative

solutions.

- ❖ Actively practice teamwork skills, listening, discussing, assigning tasks appropriately, and supporting one another during the learning process.
- ❖ Self-assess and provide feedback on their learning process and group performance, adjusting actions to achieve better results.

In conclusion, to optimize the effectiveness of PBL in higher education, there must be close coordination and synchronization between the institution, instructors, and students. Investing in the development of organizational capacity, learning support, and creating a favorable environment will be key factors in determining the success of this method in practical teaching.

5. CONCLUSION

The PBL method is not only a global trend but also an urgent requirement for higher education in Vietnam in the context of integration and digital transformation. However, successful implementation requires systematic investment in human resources, infrastructure, learning materials, and class organization models. Higher education institutions need to: Train and develop faculty members' abilities in designing and organizing PBL activities; Develop a system of timely and practical problem banks; Invest in flexible learning spaces and multimedia learning support; Establish mechanisms for evaluating the effectiveness of learner-centered teaching methods.

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