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The Effectiveness of Problem-Based Learning on Students' Ability to Think Critically

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Abstract:
This research aims to describe the effectiveness of implementing problem-based learning in an effort to develop students' critical thinking abilities. One of the advantages of the problem-based learning model is that it is able to train students to use various concepts, principles, and skills that they have learned to solve the problems they are facing. this study is a descriptive qualitative approach; this approach is expected to produce in-depth interviews and descriptions of speech, writing, and behavior that can be observed from an individual, group, society, and organizational unit of analysis. Next, according to the observed context, the data obtained is then recorded and analyzed. The results of this research are that students' critical thinking skills can develop, because the essential skills of thinking observed in this research are the ability to identify, analyze, solve problems, think logically, make appropriate decisions, are not easily provoked, and can draw conclusions carefully.

Keywords:
Effectiveness, Critical Thinking, Problem-based Learning.

INTRODUCTION

Education is a fundamental element in building an advanced and sustainable civilization (Safitri et al., 2023). The importance of education lies not only in the transfer of knowledge from one generation to the next but also in the formation of character and the development of individual skills to face the challenges of an ever-changing world (Adawiyah et al., 2023). Education opens the door to various opportunities, both in the economic, social, and political fields (Sulaiman, F., 2013). With education, a person can improve their quality of life, get a decent job, and contribute significantly to society. Apart from that, education also plays an important role in forming critical and creative thinking patterns, which are essential for innovation and technological progress.

At the community level, education functions as the main pillar in creating an inclusive and egalitarian environment (Asbari & Novitasari, 2020). Through education, social and economic disparities can be minimized because all individuals, regardless of their background, have the same opportunities to learn and develop (Siringoringo et al., 2023). Education also promotes the values of tolerance, cooperation, and peace, which are very important in building a harmonious and united society (Larasati et al., 2023). In a global context, education helps overcome various global problems such as poverty, hunger, and climate change by producing individuals who are knowledgeable and

committed to finding sustainable solutions (Adawiyah et al., 2023; Asbari & Novitasari, 2020).

Education also plays a role in strengthening the identity and culture of a nation. Through a well-designed curriculum, young people can understand and appreciate their cultural heritage while remaining open to influences and learning from other cultures. This creates a society that is broad-minded and adaptive to global change. Furthermore, education is also a human right that must be accessed by every individual (Siringoringo et al., 2023). The right to education ensures that everyone has the opportunity to develop their full potential and participate actively in the development of society (Abidin, Z. 2020; Safitri et al., 2023).

In today's digital era, the importance of education is increasingly strengthened by the need for digital literacy and technological skills. Education must adapt to current developments, integrating technology in the learning process to ensure that students are ready to face a world of work that is increasingly dominated by technology. Through education, individuals are not only taught to pursue knowledge but also to apply this knowledge in everyday life and have a positive impact on society. Overall, education is the best investment that individuals, communities, and countries can make for a better future. Through education, we can create a more just, prosperous, and sustainable world, where everyone has the opportunity to reach their full potential and contribute optimally to the global community.

Efforts to improve the quality of human resources are a challenge for universities (Agistiawati et al., 2020; Novitasari et al., 2020). Ideally, learning in higher education develops the hard skills and soft skills possessed by every student. However, the reality so far is that the lectures that occur sometimes only strengthen hard skills. The hard skills referred to here are related to mastery of lecture material (theory), while soft skills are more aimed at strengthening hard skills. According to Wagner, soft skills include the ability to think critically and solve problems (Wagner, 2018).

Critical thinking abilities cannot develop along with the physical development of each individual. This ability is related to the ability to identify, analyze, and solve problems creatively and think logically so as to produce appropriate considerations and decisions (Tinio, 2023). The problem-based learning model, or known as the problem-based learning model, is a learning model that uses real problems encountered in the environment as a basis for acquiring knowledge and concepts through critical thinking and problem-solving skills. According to Sudarman, he states that the basis of problem-based learning is a collaborative process (Sudarman, 2017). Learners will construct knowledge by building reasoning from all the knowledge they have and from everything obtained as a result of interacting activities with fellow individuals. With problem-based learning, it is hoped that students can solve problems with a variety of alternative solutions and can identify the causes of existing problems.

METHOD

The approach used by researchers in this study is a descriptive qualitative approach. Qualitative research is research that produces descriptive data, namely making observations of the speech or writing and behavior of the people being observed. This approach is expected to produce in-depth interview and descriptions of speech, writing and behavior that can be observed from an individual, group, society and organizational unit of analysis. Next, according to the observed context, the data obtained is then recorded and analyzed. The method used in this research is the listening method because the data source is obtained by listening to language use (Mahsun, 2017).

RESULT AND DISCUSSION

The Problem-Based Learning learning model is a learning model where students work on authentic problems with the aim of compiling their own knowledge, developing inquiry and high-level thinking skills, and developing independence and self-confidence.

Table 1: Problem-Based Learning (PBL) and Critical Thinking Development

Main Aspect	Key Points (Condensed & Academic)
Definition of PBL	A student-centered learning model emphasizing authentic problem-solving to construct knowledge, develop inquiry skills, higher-order thinking, independence, and confidence.
Core Characteristics of PBL	(a) Question/problem formulation; (b) Interdisciplinary focus; (c) Authentic inquiry; (d) Product creation and presentation; (e) Collaboration.
Purpose and Cognitive Outcomes	Enhances **critical thinking** through problem exploration, knowledge reconstruction, and reflective inquiry influenced by personal and cultural contexts.
Implementation Stages	a. *Preparation*: design of learning plan & activity sheets; b. *Implementation*: applying PBL to develop critical thinking; c. *Evaluation & Reflection*: identifying obstacles & assessing effectiveness.
Learning Design Focus	Emphasizes active, creative, effective, and enjoyable learning; positions students as active knowledge constructors (student-centered).
Lecturer's Role	Acts as **facilitator/tutor**—planning, guiding, and supporting the learning process to foster student autonomy.
Learning Process Mechanism	Students identify contextual problems, integrate existing and new knowledge, collaborate in groups, and propose alternative solutions.
Critical Thinking Skill Development	Critical thinking becomes habitual, supporting lifelong learning and employability. Begins with the ability to **read and question critically**.
Characteristics of Critical Thinkers	- Skeptical toward unverified claims - Curious and evidence-oriented - Seeks understanding beyond surface-level conclusions - Open-minded and logical
Critical Thinking Indicators (Ennis Framework)	a. Clarify statements b. Seek reasons c. Verify information d. Use credible sources e. Stay relevant f. Explore alternatives g. Be systematic h. Remain open-minded i. Take justified positions j. Acknowledge others' expertise
Evaluation in PBL	Integrated and process-oriented—assesses both outcomes and student engagement at every PBL phase using **critical thinking observation sheets**.
Critical Thinking Assessment Indicators	① Problem formulation ② Logical reasoning ③ Fact-based observation ④ Use of credible sources ⑤ Problem-solving ability ⑥ Openness to peer input ⑦ Awareness of consequences
Expected Educational Impact	Produces learners who are reflective, analytical, collaborative, and adaptive — equipped with critical thinking habits for academic and real-world problem solving.

The characteristics of Problem-Based Learning include: (a) asking questions/problems, (b) focusing on inter-disciplinary relationships, (c) authentic inquiry, (d) producing products and exhibiting them, and (e) collaboration. In Problem-Based Learning, students are freed to obtain key issues from the problems they face, define gaps in their knowledge, and pursue lost knowledge (Hmelo-Silver & Barrows, 2016).

For this reason, Problem-Based Learning is seen as a learning model that is able to improve high-level thinking abilities or critical thinking abilities. Critical thinking abilities are influenced by intrinsic and extrinsic drives. A person's personality and cultural background can influence a person's efforts to think critically about a problem in life (Hassoubah, 2017). Implementation of learning

using Problem Based Learning in this research includes several steps, namely 1) Preparation carried out by lecturers by preparing Semester Learning Activity Program Plans and Student Activity Sheets; 2) Implementation of learning by applying PBL in an effort to develop critical thinking skills; 3) Evaluation and reflection with research subjects regarding the obstacles encountered in implementing Problem Based Learning in an effort to develop critical thinking skills.

The planning of learning activities has been carried out by lecturers in science learning courses. In the plan that has been prepared by the lecturer, a learning plan has been written that uses the Problem-Based Learning model. The application of the Problem-Based Learning model supports the implementation of active, creative, effective, and enjoyable learning. Students will be fully involved in the learning process because students act as learning subjects (student-centered learning). Implementation of learning by applying Problem-Based Learning according to Delisle includes: selecting content/material and skills to be studied, determining the learning resources used, writing problem formulations, determining motivation, determining the focus of questions, and how to evaluate (Delisle, 1997; Puspitasari, et all., 2023). The Problem-Based Learning learning design in this science learning course focuses on developing students' critical thinking skills. Lecturers in this case are more involved only as facilitators, who plan activities and support the ongoing learning process. This is in accordance with Newman's opinion, which states that in Problem-Based Learning, the task of the teacher or lecturer is as a tutor or facilitator who is tasked with developing the knowledge and skills of members of the community (Newman, 2015).

Previous research has also exposed this problem and documented several solutions. According to Wulandari, this problem-solving process helps students integrate the knowledge they previously acquired with the problem or information obtained to be able to offer various alternative solutions. Wulandariah revealed that Problem-Based Learning is designed by confronting learning with contextual problems related to learning material so that students know why they are learning, then identify problems and collect information from learning sources, and then discuss it with friends in their group to get solutions to problems while achieving goals. learning (Wulandariah, 2021). This is also in line with Sudarman's opinion that Problem-Based Learning is a learning approach that uses real-world problems by applying critical thinking processes and problem-solving skills to obtain essential knowledge and concepts from learning material (Sudarman, 2017). According to Hasruddin, Critical thinking skills need to be developed and accustomed to by every individual. This critical thinking habit will be carried over by students until they enter the world of work. This is what differentiates graduates from higher education from those without higher education. Critical thinking skills will help students solve various problems they will face, whether they are encountered now or in the future. According to Hasruddin, the ability to think critically starts from the ability to read critically (Hasruddin, 2019).

Thinking is asking; it doesn't mean that silent people don't ask. So, in the activity of asking questions silently or asking questions while studying, a person is said to be using their thinking abilities. According to Marissa Anita, critical thinking skills are: (1) It is not easy to swallow a statement or conclusion whole; (2) Have a healthy questioning attitude towards statements and conclusions; (3) Have curiosity and the desire to examine the existing evidence to understand a

statement or conclusion in its entirety, there are many sensational statements scattered around us, for this we need to think critically (Marissa Anita, 2021; Rochbani & Nurdianingsih, 2023).

It is not uncommon for illogical thought patterns to carry over into adulthood, making us easily believe in things that are actually just assumptions. The ability to think critically has certain characteristics. According to Ennis, namely: (1) Looking for a clear statement of each statement; (2) Looking for reasons; (3) Try to find out the information well; (4) Use sources that have credibility and cite them; (5) Pay attention to the overall situation and conditions; (6) Try to stay relevant to the main idea; (7) Considering genuine and fundamental interests; (8) Looking for alternatives; (9) Be open and think openly; (10) Taking a position when there is sufficient evidence to do something; (11) Seek as many explanations as possible whenever possible; (12) Behave systematically and orderly with the parts of the whole problem; and (13) Be sensitive to the level of knowledge and expertise of other people (Ennis, 1991).

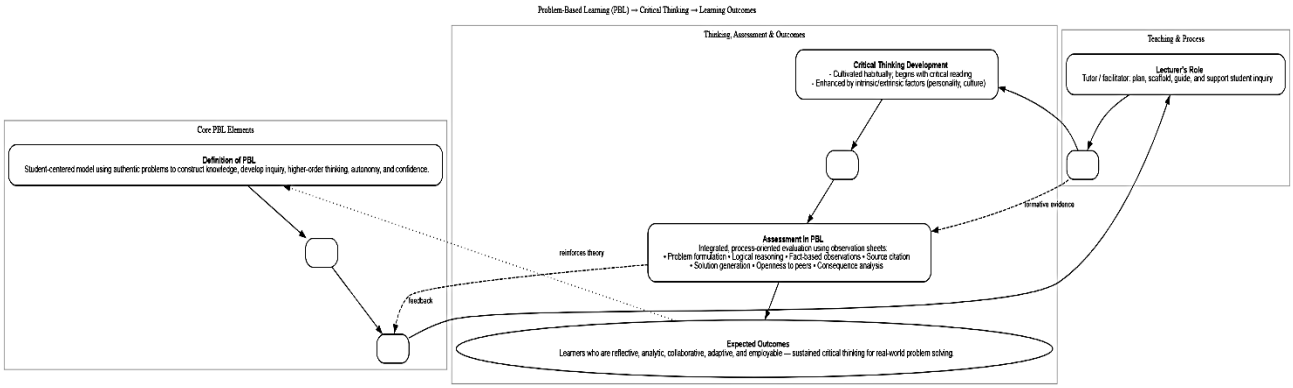

Figure 1. Problem-Based Learning (PBL) and Critical Thinking Development

The evaluation carried out in Problem-Based Learning is carried out in an integrated manner. Assessment not only assesses the final results of the knowledge they have learned, but also includes all activities that include the implementation of each step of Problem-Based Learning, which involves students' critical thinking abilities. Critical thinking skills are assessed using a critical thinking ability observation sheet. This sheet contains indicators that show the level of critical thinking abilities including; 1) able to formulate the main problem; 2) able to provide logical and relevant reasons; 3) able to express facts based on observations; 4) use relevant learning sources of credibility and mention them; 5) able to determine solutions to existing problems; 6) able to answer and be open to friends' opinions; 7) able to determine the consequences of making a decision.

CONCLUSION

The application of problem-based learning can help develop students' critical thinking skills. Students need to develop critical thinking skills as an effort to prepare themselves to face the challenges and problems they will encounter now and in the future. The steps of the Problem-Based Learning learning model used: 1) identify the problem, suitability of the information obtained; 2) explore interpretation; 3) determine alternatives as solutions; 4) communicate conclusions; and 5) integrate, monitor, and refine strategies for resolving problems.

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