

# Implementation of *Problem-Based Learning* to Critical Thinking Ability in School: *A Systematic Literature Review*

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**Abstract.** The curriculum 2013 encourages critical thinking skills that has a purpose of learning and must be achieved to the education. This research aims to claim the trend of implementation abilities of critical thinking skills in learning at school. The method in this research is a systematic literature review (SLR) study. This research indicates that this trend was initially apparent after its first application of the Indonesian government using a scientific approach. But in fact, Problem Based Learning (PBL) approaches and critical thinking capabilities are incompatible with the context of education. So, the SLR is verifying the essential implementation of the PBL in sharpening the capability of the data on online research from 2009-2018. This systematic review concludes that the following methodological and based literature of key and current literature is necessary. Those research will support scientific comm problem-based learning cities and practitioners for the PBL method and critical of studying.

**Keywords:** problem-based learning, critical thinking ability, implementation, systematic literature review (SLR)

## 1 Introduction

One of the most critical cognitive skills that the industrial sector is vital thinking ability (KKNI). Essential thinking ability is necessary to solve various complex problems that can provide innovation to create an advantage. Facing the global rivalry era, educators in the world constantly focusing their attention on the valuable study strategy growing critical thinking ability of students. The Indonesian government also always ensures the capacity of good-minded principals must have by high school students. But in fact, not all the educators have a consciousness of the strategy growing critical thinking ability of students. Even most educated participants haven't felt the way they were taught in school, not allowing any applications to think critically [1]. One of the approaches of the teaching that the government suggested as the principal's critical minds of the school's critical minds are the fundamental lessons of Problem Based Learning (PBL) [2]. The government also continues to attempt to increase the quality of education in Indonesia. One of the ongoing agendas is developing the curriculum development, including the development of the judgment system. The model of judgment used

now is the 2013 curriculum that has adopted the international standard assessment model. One of the characters is more stressed to think critically. The concept is to be strengthened with the previous education purposes but more directed to the formation of the education capabilities. To think critical, creative, creative and innovative, and innovative capabilities as well as able to solve more complex problems in a challenge which he will face in education [3].

Education is expected to produce a generation capable of dealing with the challenges and problems it faces, especially the preparation of future generations and characterful, agile, skilled, critical, and creative. In line with the concept of educational skills in the 21st century, according to Raizen's team focused on four categories, namely ways of thinking (creativity, critical thinking, problem-solving, decision making, learning, and innovation), ways of working, or how to work (comm problem-based learning and collaboration), tools for working or working tools (I.C.T. and information literacy/digital literacy), living in the world (citizenship, life, and career, personal and social responsibility) [4] are in line with the case in the problem-based learning try of Indonesia, Critical thinking skills have become an essential part as learning goals to be achieved in the world of education, as stated in Permendikbud No. 73 problems based learning 2013 tentang Kerangka Kualifikasi Nasional Indonesia (KKNI). Critical minds of critical thinking capabilities have been developed and conventional schools from a high level, middle and high [3]. Learning is an attempt to lead students to learn the goal of learning process according to the expected [5].

Regardless of the various problem-based learning excess, most educators are reluctant to apply the problem-based learnings in learning process, and even educators tend to do it reluctantly. As for research/research states that great educators prefer to use traditional methods of memorial/conventional and a direct approach of teaching as well as problem-based Learning [26].

Therefore, this research will focus on implementing the development method of development capabilities critical, which is the problem-based learnings. A question that can be asked is whether problem-based learning is effective means to implement or grow the critical minds of the educated participants.

## **2 Research Methods**

This research using the systematic literature method. Systematic Literature Review is literature review that follows a series of basic rules to identify and synthesize research and a matter of judgment to what the subject is known to the subject of the study [23]. This systematic review can provide a significant donation, allowing the policy to compose an approach based on weighing research information and identifying a gap in the following research. Research articles are selected through a database of various types of journals based on keywords used. Keywords used in the search Problem based learning/problem-based learning, critical thinking skills/analytical skills/critical thinking for students in SMA/SMK/MAN in Indonesia. For the purpose of obtaining the latest study, the search has been limited between 2009 and 2018. The criteria are as follows: (a) an observational study that observes the implementation of PBL and measures changes in the level of critical thinking ability, (b) study targeting implementation issues based in Indonesia (c) studies that are written in English and Indonesian language.

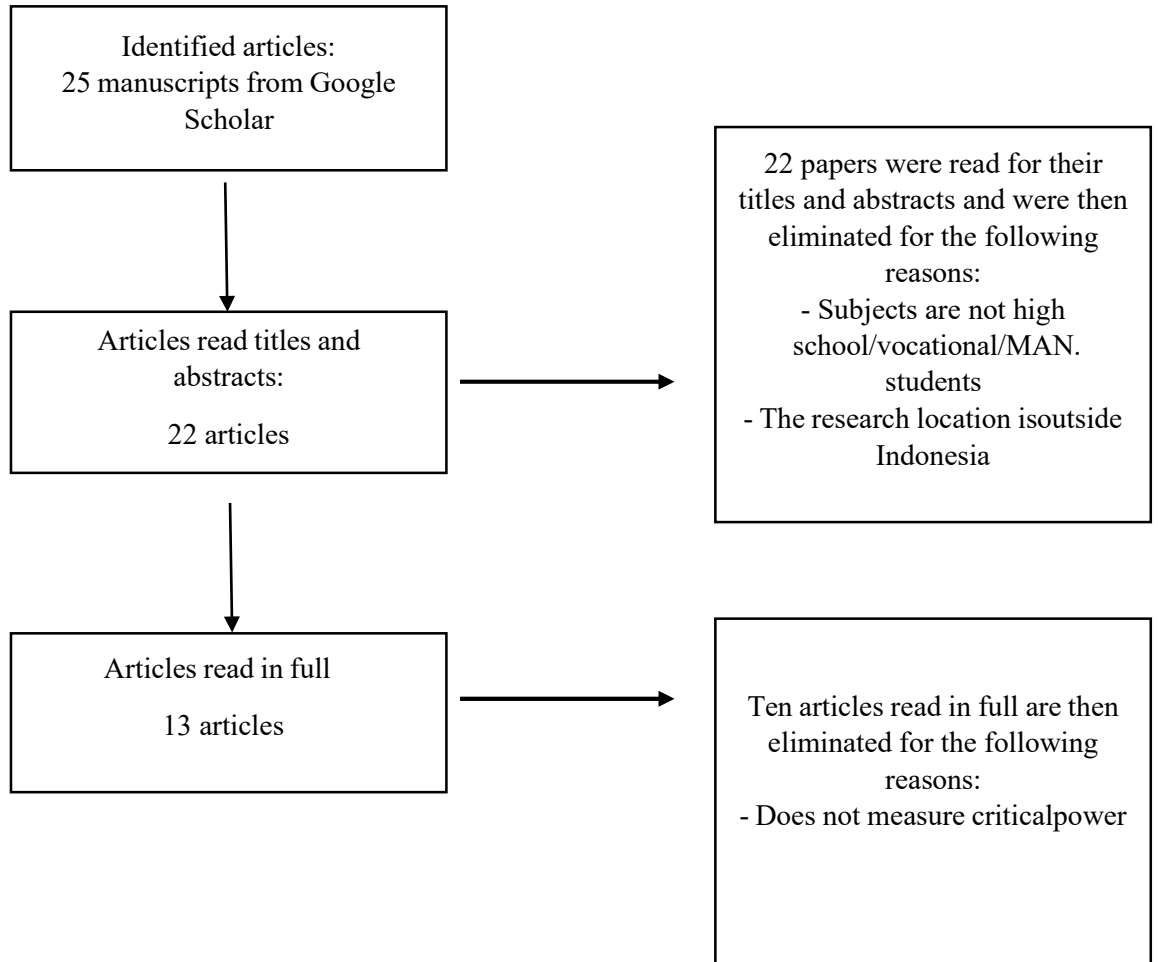
A total of 13 studies have been selected to be analyzed based on the four steps in

systematic literature review analysis. The figure 1 have shown the four steps in systematic literature review analysis based on [6]. For the first step which is framing a question. For framing an answerable question in a systematic literature review, the researcher used the PICO framework. PICO is an acronym for “Participant-Intervention-Comparator-Outcomes”. In this research paper, participant refers to individuals or population of interest to researcher. Intervention needs to be as broadly or as narrowly defined keeping only the intervention of researchers’ interest. Comparator refer to either the intervention versus placebo or interventions versus conventional treatment or interventions and no treatment are compared. The outcome that researcher is interested can be narrowly or broadly defined based on the objective of the literature review analysis. The outcome is narrowly defined, then literature review analysis is only restricted to that outcome. The researcher is interested to find out if strategy to increase the critical thinking skills in problem-based learning is enhancing students’ achievement.

The second step which is run a search of the literature databases. After the researcher have decided the PICO, the researcher conducted a search of the literature databases. For the third step which is selected the articles for literature review analysis by reading titles, abstracts and full texts. The researcher set up a scheme where the researcher decided to select and reject the articles for literature review analysis. For example, the article is relevant for the study question, the article does not discuss the outcome that is of interest to this research and the article is published outside of the date range. Because of that only 22 articles have been chosen to be analysed. For the last step is abstract the information from articles. In this matter, the researcher abstract the information from articles and then put all those needed information into table synthesis matrix according to subthemes: authors, research objective, sample or respondent, research design, analysed data and the findings. From that table analysis, the researcher can make some similarities and differences in the 13 studies.

### **3 Results and Discussion**

Through the search on the online article database, has been problem-based learning over 25 articles. On 25 articles are then read again to 13 scripts with the consideration of the abstract contents with the conditions of the use. At 22 of these scripts, read full texts and acquire several 13 manuscripts that match all the critically determined. The process we illustrate in the following chart:



Picture 1. Process of identification study

Number	Name, Year	Title	The Methods of Learning, Problem, and Research Subject	Design Research and Methods of Research	Research Purpose
1	(Anggraini et al., 2020) [7]	Peningkatan Hasil Belajar Kognitif Biologi Melalui Problem Based Learning Pada Siswa Kelas X SMA Negeri 1 Bulu Sukoharjo	The problem that occurred is the low biology study and root of its problem at biology learning that is not according to the 2013 curriculum. So the solution is classic research by using a PBL model. Data and data sources are from students made subjects of research and biological subjects.	The kind of research used is a P.T.K. made up of two cycles	This research aims to increase the result of biological, cognitive studies through the model of the Based Learning Problem Problem to the 1st State High School Students
2	(Faizah et al., 2013) [8]	Pengembangan Perangkat Pembelajaran Berbasis Masalah problem based learning untuk Meningkatkan Softskill dan Pemahaman Konsep.	According to observation, about 70% of students still consider that chemistry is not easy to nail, mainly to solve the problems of PBL. Inside chemistry, many formulas and concepts require a more significant problem-based learning method. Besides, students consider that the poem is less app-trained, but only as a theory and a memorial. One of the causes is a method of learning. Rejected from the problem, then it needs a creative and exciting learning device to learn to be more coated and centered on students and a mena skill set up early. One of the model Learning is the introductory learning lesson of PBL. The subject of research is a class of XI-6 science students as a comprehensive test class, a class XI-7 science students as a limited test class.	This research method is Research and Development.	This research aims to analyze the validant elevation of learning devices, increase soft skills and forgeries, and student response. The results pointed at the development of a learning device based on the hydraulic that the salt-based material has valid criteria with a 3.57, there is a soft skill with N-Gain.

3	(Munandar et al, 2018) [9] Pengaruh Model Pembelajaran Berbasis Masalah Berbantuan Media Animasi Terhadap Kemampuan Berpikir Kritis dan Hasil Belajar Fisika Siswa SMAN 5 Mataram Tahun Ajaran 2016/2017	During the study process, the teachers should help students actively look for concepts, principles, and facts to themselves, not just give lectures and control classes. The study process that Teacher-Centered is still in high school 5 Mataram. It's based on the results of observations that have been done in high school 5 Mataram. To overcome such a necessary study model. One of the models of learning that can be used is a problem-based study model with animated media.	This kind of research is an experiment of perfection. Experimental research is a way to test the cause-effects, where given treatment to a particular subject to find its effect.	This research aims to know the effect of studying subject-based problems(PBLM) with animation of critical thinking skills and studying high school physics in 2016/2017.
4	(Lestari et al., 2017) [10] Penerapan Model Problem-Based Learning untuk Meningkatkan Keterampilan Berpikir Kritis dan Hasil Belajar Siswa	The industry is a pretty partner of students who are proud partners in the Smart Information Surakarta (SMKITSI); it is less creative in completing the work you give. The industry delivers, when students are given a job to fix the P.C., students have trouble in mending the planes facing P.C. damage, so when determining repairs, that must be in doubt. All this time, in the process of defense of the seldom of P.C. damage that man is given to simple, students also feel difficulty facing the real problem. Through the peddles of critical thinking skills, students will be helped in the process of identifying. To build critical thinking skills, teachers can give experience study by designing the study process. The teacher prepared the learning by providing the issues that meli-batted student's thinking skills and the Meli batting process based on a real problem. One of the applied learning models is the Based	This research is classroom action research. The subject of study is class X- class competence T.K.Jskills. Data collection uses method observation with instruments checklist and work points. Data acquired analysis described	This research aims to increase critical thinking skills and studies critical students and studies for students in the Middle Computer Problem (T.K.J.) in studying P.C. models and research problem-based Learning

5	<p>(Noprian daet al., 2019) [11]</p> <p>Keterampilan Berpikir Kritis Siswa Model Pembelajaran Problem Based Learning dan Sains Teknologi Masyarakat pada Konsep Virus.</p>	<p>Learning Problem or the problem-based studies. The subject in this research is a class of XB SMK IT SI, where the students are at the semester of the even-semester of repair material and reclaim P.C.</p> <p>Based Learning problems can facilitate critical thinking students. The specific process in the U.N. theoretically supports the development of essential students according to the applied design (Masek) Yamin, 2011.</p> <p>The research subject is an 11 State High School student of the 11th City, Southern Army of the X-class who is 64 students.</p>	<p>The type of research is a rule of experimentation that doesn't allow researchers to control or manipulate all relevant variables except for some variables. (Sugiyono, 2013)</p>	<p>This research aims to know the difference of critical thinking skills of students being taught by models of based Learning Problem and Science of the Virus concept</p>
6	<p>(Nurhayati et al., 2019) [12]</p> <p>Pengaruh Model Problem Based Learning, Kemampuan Berpikir Kritis terhadap Kemampuan Berpikir Tingkat Tinggi</p>	<p>The lack of pro-educated participants in the process of learning to lead to independence, and the process of thinking is not well-understood so it doesn't accomplish a meaningful study process. The pro competitors experienced certainly results in low learning results (Barus, 2018, P. 18. The development of studying the protégé shows it acquired the average of the determined K.K.M.</p> <p>This research was performed at ICIP PGRI Pontichild students at a semester II student studies for 34 students.</p>	<p>The research method used as a method of an Allocated experiment with a two-way design ANOVA.</p>	<p>This research aims to know the impact of the impact of model the problem of the based learning, critical thinking skills, and interaction against the high-level student material of optics</p>

7	<p>(Rehana, 2013a) [13]</p> <p>Model Pembelajaran Berbasis Masalah dan Pertanyaan Socratic untuk Meningkatkan Keterampilan Berpikir Kritis Peserta Didik.</p>	<p>One of the challenges that the teacher made was to confront the students with problems.</p> <p>As for the evaluation of M.P.S. effectiveness in increasing student's critical skills, models the direct lesson is used as a comparison.</p> <p>The population in this research is high school students in the Bali Bullet. The number of schools involved in this research is four high schools. Every school was taken two parallel classes, which was class XII</p>	<p>Testing effectiveness in increase the skills of thinking critical students are done with using a domestic research experiment with a non-equivalent design control group design. As a comparison it's a direct learning model.</p> <p>On the kind of research of a domestic experiment, the classes that already exist class. Used in this research.</p>	<p>M.P.S. This research is aiming for testing the effectiveness of the model of learning based problems and question Socratic to increase the skills of students' critical thinking skills on science subjects</p>
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8	Yulianti, E.(2018) [24]	Efektivitas Model Pembelajaran Problem Based Learning (PBL) Terhadap Pemahaman Konsep Dan Berpikir Kritis Peserta Didik SMA	<p>According to the research, observation was problem-based learning problem, which is some students don't listen to the lessons that are taught by educators (talking to the other friend, often admitted to the toilet, sleepy, passive, complex to a understand the concept of matter, and practiced their critical power in confronting. And the issue of educators, which is the educator still dominates classes, tends to lecture, less motivation, and low-volume of educators in matter delivery. As for the learning model that was capable of developing and adopted, so the protégé was stationed as the learning center by applying models study.</p>	The research method was the quasi Experiment with pretest-posttest design control design. The data of concept and thought critical is gathered through the essay test instruments.	This research aims to discover the effectiveness of the problem learning model based Learning against the idea and critical thinking of the education High school on temperature material and colors.
9	Yulisman etal., 2019 [14]	Meta Analisis Implementasi Landasan Pendidikan dalam Pengembangan Buku Siswa Dengan Menggunakan Model Problem Based Learning untuk SMA.	<p>This research is in the X-High-School N1 away of Eastern Labor, 70 students of the educated.</p> <p>Education is the education of the student's liberation available as student books, teaching books that don't use the education models or by the government is K- 2013.</p> <p>The development of student books is required because the education of the students' limits in explaining material in learning material to complete and aiding education models to meet and aid education models based to contain student's development of problem should be carrying a basic education model.</p>	This research uses a meta-analysis design. Instruments in this research use the Human Instruments.	Developing student books by using a creative prophecy model-based learning, it may be possible to contribute not only to student understanding and the student's ability to vary answers soother than increasing the educational understanding of its own.

10	(Rehana, 2013b) [15] Model Pembelajaran Berbasis Masalah untuk Peningkatan Keterampilan Pemecahan Masalah dan Berpikir Kritis	The papers made by each group of the educated participants indicate that the fewer participants were educated appearance solving problems. The educator only uses onesourcebook. The pro does not seek another reference to enhance his discussion in the paper. As a result, a debate made by a very shallow participant and strictly follow the sequence of material that exists in one The teacher provided the sourcebook. And according to U.H.'s grades, the grades of the steps and the stages of this pro-up value are still going to need to be repaired and upgraded.The ability of the education can still be enhanced if that learning it was applied to give a chance to a pro-educated trainee to use and develop critical thinking skills in the process of solving problems.	The study of class acts was executed in two cycles	The study of this class acts is aiming for increase the skill of solving problems and thinking critical students by applying studies-based problem.
11	(Leary et al., 2013) [2] Exploring the relationships between tutor backgroun, tutor training, and student learning: A problem-based learning meta-analysis.	This research analyzes the gaps in the relationship between research designs with the educational abilities in learning.	Meta-analysis research that uses precise methods and cross-discipline.	The primary objective of this research is to expand an attempt to reviewwhat exists by investigating the connection between tutor training, tutor background, and student studying results.

12	(Sujanem et al., 2018) [1]  The effectiveness of problem-based hybrid learning model in physics teaching to enhance critical thinking of the students of SMAN	The problem that appears is how effective the pro-ball teaching is. Regarding the low-level high school classes in Bali, alternative solutions need to be problem-based learning to train student C.T.s according to the 2013 curriculum. One alternative model considered capable of training C.T.s with the Based Hybrid Learning Problem model. Model to boost high school students C.T.s The model of the Based-Hybrid-hybrid Learning (Pro-BHL) which reports that the study of physics with a pro-the modelin 1st Singarang one st-BHL (Pro-BHL), which reports that the study of physics with a pro-BHL model from High 1 Singarang. This research involves 86 students divided into three groups class X.	This research stressed an analysis of pro-B.H.L. influence analysisin the physical studiesof student C.T.s, Therefore in this research used pre-experimental with pre-test-test designs and post-test	This research aims to analyze the effectiveness of the Based-hybrid Problem The pro-BHL research to increase thecritical thinking ability of high school students physics lessons.
13	(Dwi et al.,2013) [16]  Pengaruh Strategi Problem Based Learning Berbasis ICT Terhadap Pemahaman Konsep dan Kemampuan Pemecahan Masalah Fisika	Based on observation, that learner of physics still uses the traditional methods of tradition and has not practical trainingto solve problems, so the fewer students don't even have any issues. The design of innovative learning attempts using effective strategy against concept problem-based learningderstanding and student matters' capability is necessary so that the use of an ICT-based PBL strategy will be adequately supported by the success of the defense of the defender Yassin (Yassin, Dkk) and contribute to the achievement of the results of studying desire (Fong Ma,	This research used a perfectly septic experiment with a pre-test-testpost-test control groupdesign.	This research aims to test the difference between understanding of concepts and problem-solving ability between students who are learned by using ICT-based U.S. strategy and students who are studied withthe PBL strategy.

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2008).

The study process with the ICT-based PBL strategy has a significant influence on concept understanding and the ability of the educational problems.

The population is the entire state X-X-1st High School student 2012-2013. Sample 72 students divided into two classes taken with Random Purposive Sample. The instruments used are grains of concept understanding and the ability to solve problems in the form of an outline.

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### 3.1. The lesson

The following research results were acquired from 13 journals based on the subject and matter discussed with a model learning subject. Once the analysis of 13 journals, then it's seven subjects and material discussion. The subject of a debate is physics, biology, technology, science, mathematics, automotive, and organization behavior. That three journals discuss physics subjects, and two journals discuss biology subjects. Another lesson is, technology, science, mathematics, automotive, and organization behavior is one journal discussion. Based learning's subject is a subject to a fundamental basic learning problem in increasing the critical ability of students' critical thinking of science. But the lack of influence on social subjects, the vital thinking student's ability to experience a good change after using model problem-based learning [13]. There are increased critical mindset and anxiety in learning progress with problem approaches-based learning. Besides, there's a correlation between the based learning problem syntax with essential indicators of thinking so that the based learning problem can push the critical ability of students [25]. The impact of model problem-based learning can positively affect necessary mindset and study results [17].

### 3.2. Research instruments

While other studies, even though it's not narrow, defines the problem-based learning's approach as solely supplies of problems or cases to students, they also do not adapt other vital components in the issue-based understandings. For example, [7], [7] does not give students a chance to collaborate on cases as [18], social constructive located in the heart of the problem-based learnings approaching students demanding a solution solutive and transaction. Barrows (1986) [19] Argues that the group's work is essential in problem-based learning because one of the primary goals of the problem-based learning approach is developing professional skills of student's future, and working together is one of these skills.

In a world that's more obscures geographic bulbs, collaboration is the key to confront the era of global competition. The teacher must realize this and understand that PBL can be the means to prepare the students to face the global challenges of the future. According to the leading U.B.S. researchers, the role of teachers is far more vital than the role of teachers in the traditional approach [20] and [18]. Teachers in the problem-based learnings approach should be more thorough in social engineering to ensure the nuances of learning that encourage collaboration and display cases that stimulate education's passion.

There seems to be a terrible understanding about the role of situation-based learnings in issue-based learnings. Of twenty studies, only three studies have the correct view of teachers as facilitators in the problem-based understandings. These studies are [21], [22]. While the teacher in the traditional teaching classes is the center of learning where teachers control matter, problems, and procedure solving students, teachers at the issue-based learnings "encourage students with meta-cognitive questions and give explicit directions to what to look for where to find information. The teacher provides an environment of studying central students by pushing independent learning lessons, integration lessons with previous knowledge, interacting with students, and guiding learning process" [2]. Thus, the Problem Based Learning teacher played a guide, not just a pitcher.

As Barrows said [20] and became consensus [18] [2]; the U.S. Walker made up five key elements obligated and supporting each other. Those elements are the learning-centered on students, teachers as facilitators, actual cases or unstructured, emphasis on long-term professional career skills, and cooperation among the educated experts of the group.

## 4 Conclusion

This literature review demonstrates the generally positive effect of educational critical thinking ability in PBL. Further research into the various applications of educational technology in PBL curricula is needed to fully realize its potential to enhance problem-based approaches in vocational education and to review aims to assess the implementation Problem-Based Learning (PBL.) in increasing the critical ability of educated scientific methodology and tested the extent of sound scientific methods. The result of systematic literature reviews identified 22 research that the majority reported a significant influence of the implementation approach learning to the educated analysis of Indonesia.

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