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The Implementation of Mind Mapping-Assisted Problem-Based Learning Model in Geography Lessons to Enhance Critical Thinking Skills of SMA

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ABSTRACT

Rendahnya tingkat keterampilan berpikir kritis di kalangan siswa pada pelajaran geografi di kelas XI.F SMA Negeri 3 Singaraja merupakan masalah yang perlu diselesaikan. Dalam hal ini, penelitian tindakan kelas (CAR) dilakukan untuk menganalisis penerapan model PBL yang didukung Mind Mapping dalam pelajaran geografi dan untuk meningkatkan keterampilan berpikir kritis melalui model Pembelajaran Berbasis Masalah yang didukung Mind Mapping. Penelitian ini menggunakan desain Penelitian Tindakan Kelas (CAR) Kemmis & McTaggart, yang dilaksanakan dalam dua siklus dengan 42 siswa kelas XI F SMA Negeri 3 Singaraja sebagai subjek penelitian. Data dikumpulkan melalui observasi dan tes, kemudian dianalisis dengan metode deskriptif kuantitatif. Hasil menunjukkan bahwa penerapan model Pembelajaran Berbasis Masalah (PBL) yang didukung Mind Mapping berjalan dengan baik. Keterampilan berpikir kritis siswa meningkat sebesar 22,20%. Oleh karena itu, model Pembelajaran Berbasis Masalah yang didukung oleh Mind Mapping efektif dalam meningkatkan keterampilan berpikir kritis siswa dalam mata pelajaran geografi di SMA Negeri 3 Singaraja.

The low level of critical thinking skills among students in geography lessons in class XI.F at SMA Negeri 3 Singaraja is a problem that needs to be solved. In this regard, a classroom action research (CAR) study was conducted to analyze the application of the Mind Mapping-assisted PBL model in geography lessons and to improve critical thinking skills through the Mind Mapping-assisted Problem-Based Learning model. This study used Kemmis & McTaggart's Classroom Action Research (CAR) design, which was carried out in two cycles with 42 students in class XI F of SMA Negeri 3 Singaraja as the research subjects. Data were collected through observation and tests, then analyzed using descriptive quantitative methods.. The results showed that the application of the Mind Mapping-assisted Problem-Based Learning model went well. Students' critical thinking skills increased by 22.20%. Thus, the Mind Mapping-assisted Problem-Based Learning model is efficacious in improving students' critical thinking skills in geography at SMA Negeri 3 Singaraja.

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INTRODUCTION

Technological developments and social dynamics in the 21st century have revolutionized access to information and human interaction, encouraging education to place greater emphasis on developing 21st-century skills (Septikasari, 2018). These skills are essential for students to succeed in higher education, the world of work, and life in the information age (Hidayati et al., 2022). According to the National Education Association (n.d.), these skills are known as "The 4Cs," one of which is critical thinking (Redhana, 2019). Critical thinking is a top priority in equipping students to face the challenges of the 21st Century. Critical thinking is a high-level type of thinking at the cognitive level. An individual

can understand critical thinking as the ability to generate ideas and make decisions from various perspectives in a detailed, thorough, careful, and logical manner(Nadila & Sitompul, 2021). In addition, according to Hikayat et al. (2020), critical thinking is a process of reasoning and analysis that leads to conclusions. With critical thinking skills, students can reason logically and solve problems In line with this, Harahap et al. (2020) argue that students who think critically can formulate relevant questions, gather pertinent information, and evaluate it to reach appropriate conclusions. It is essential in the problem-solving process.

Astuti et al. (2013) argue that critical thinking skills are essential to learn and develop for several reasons, including: (1) in today's era of information and global competition, it is necessary to overcome various complex and unforeseen problems; therefore, honing competencies such as critical thinking is crucial, given the increasing complexity of issues in modern life, (2) critical thinking is essential in analyzing, compiling, and evaluating various arguments to be able to make rational and responsible decisions, (3) One of the key skills for survival in an ever-evolving world is critical thinking, which must therefore be the primary focus in adjusting the education system, (4) Students who participate in learning oriented towards critical thinking skills will reap benefits, such as the ability to solve problems effectively, both during the learning process in class and when facing daily challenges. Critical thinking is one of the factors of intelligence that students must possess, and this ability is essential to be developed in every learning process at school. An inability to think critically will make it difficult for students to solve problems that require higher-order thinking skills (HOTS). The following skills can identify critical thinking skills: (1) providing simple explanations that focus on questions, analyzing opinions or arguments, asking and answering questions to find information to solve problems, (2) building basic skills in students, including source credibility and considering observations, (3) inference, which includes constructing deductions and inductions, considering deductions, inductions, and problem-solving results, and (4) advanced classification, which includes identifying and considering definitions and assumptions, and (5) finally, strategies and tactics, which include determining appropriate actions (Ennis, 2011).

However, the reality is that students' critical thinking skills in Indonesia are still low. The results of the 2022 PISA (Program for International Student Assessment), which were participated in by 81 countries, show a decline in scores from the previous year. PISA shows that Indonesia ranks 69th with a score of 359 (OECD, 2023). Students' low critical thinking skills in analyzing PISA questions stem from the lack of emphasis on developing these skills in school learning (Hikayat et al., 2020). The suboptimal performance of teachers in creating learning experiences that develop critical thinking skills leaves students unfamiliar with these skills, thereby hindering their ability to analyze PISA-type questions critically.

This problem was also found among students in class XI F at Singaraja State High School 3. Based on interviews with geography teachers, it was found that students' critical thinking skills were still low. Students had difficulty answering essay questions that required analyzing problems, connecting concepts, and providing appropriate reasons. This condition indicates that critical thinking skills in the analysis indicator (C4) remain very low. In addition, students who participate in learning tend to be passive. Most of them only listen to the teacher's explanations and lack the initiative to ask questions or express their opinions. When asked questions, only a few students participate, while others choose to remain silent or wait for answers from their friends. This low level of participation indicates a lack of student involvement in the learning process, which in turn weakens critical thinking skills. It aligns with the findings of Hidayati et al. (2022), who found that passive student characteristics can contribute to low critical thinking skills. In addition to interviews with geography teachers, field observations revealed that the learning process lacked teaching activities that could hone students' critical thinking skills, including: (1) The teaching model used by teachers is still dominated by a teacher-centered approach, namely a direct instruction model that provides insufficient space for students to be actively involved in the learning process, (2) The methods used are still in the form of lectures, which tend to make students passive, (3) In learning activities, it is apparent that most students ignore the material, active students are dominated by those who are considered capable, while less capable students tend to be quiet and do not get the opportunity to participate. As a result, students appear less enthusiastic and less motivated to learn because they think geography is a boring subject, (4) In addition, the use of innovative learning media is still limited. Teachers only use PowerPoint to

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deliver material, so students quickly become bored and less interested in learning geography. It is in line with the opinion of Astuti et al. (2013) argue that geography education today tends to emphasize memorizing various facts, even though this approach is no longer relevant to current conditions. People often underestimate geography lessons as a discipline that is merely descriptive or a mere memorization exercise (Suarsini et al., 2020). Implementing the right learning model is one way to develop students' critical thinking skills. Geography, as a branch of science, requires critical thinking skills to apply basic geographical concepts to phenomena in students' environments through problem-solving (Amin, 2017). Therefore, it is essential for educators to consistently choose teaching models that not only improve students' critical thinking skills but also support their continuous development (Septiany et al., 2024). One solution for classroom learning is to implement a model that centers students in the learning process. One student-centered learning model is Problem-Based Learning (Emanet & Kezer, 2021).

Octavia (2020:21) argues that PBL is a learning model that offers students a variety of authentic and meaningful problem situations that serve as a basis for student inquiry. The PBL approach encourages learning through the "learning by doing" concept, providing students with opportunities to engage directly in the problem-solving process. According to Devi & Bayu (2020), the problem-based learning model has stages that are in accordance with critical thinking indicators. Students are exposed to a discourse related to real phenomena or problems concerning the material to be studied, then identify or analyze the problems, formulate problems, gather information from various sources or through practicums and observations, evaluate alternative solutions, and finally present the results of their discussions. The problem-based learning model has stages that align with critical thinking indicators. Students exposed to a discourse related to real phenomena or problems concerning the material to be studied, then identify or analyze the issues, formulate problems, gather information from various sources or through practicums and observations, evaluate alternative solutions, and finally present the results of their discussions. It improves students' analytical, interpretive, evaluative, inferential, and explanatory skills (Ersoy & Başer, 2014). PBL has a positive impact on critical thinking when the learning process involves students in collaborative problem-solving. In addition, with the implementation of PBL, students become more active and classes are no longer passive (Abdullah & Munawwaroh, 2024). Therefore, through the PBL model, 21st-century learning objectives can be achieved. Problem-solving is one of the key skills required of students in problem-based learning, but finding quick, imaginative solutions to inevitable challenges and difficulties is not easy. In addition, when students lack interest in or attraction to the problems given, they consider the solutions too difficult (Octavia, 2020). Therefore, to minimize the occurrence of such issues, it is essential to employ learning media that integrate with the PBL model's syntax, such as mind mapping.

Mind mapping is a thinking aid based on divergent thinking, building a knowledge structure for each target word by linking it to other related words or concepts (Wang & Dostál, 2018). The use of mind mapping as a teaching aid not only helps students improve their learning effectiveness but also enhances and develops higher-order thinking skills (Windura, 2013; Rosciano, 2015). Mind maps provide a simple overview of complex information, allowing students to understand the associations between concepts (Kong et al., 2014). In addition, because this system aligns with the natural functioning of the human brain, it enables optimal use of human brain potential and capacity (Sumitadewi et al., 2022).

Seeing the characteristics of students in class XI. F at SMA Negeri 3 Singaraja, who tend to be passive in the learning process, indicate that they need strategies that encourage active engagement, collaboration, and systematic organization of concepts. Given these conditions, integrating mind mapping into the PBL model helps students organize and comprehend learning problems through systematic concept visualization. Lrted by the mind-mapping technique, fosters an engaging and enjoyable learning environment. Consequently, students become actively and deeply involved in the learning process, ultimately enhancing their curiosity, critical thinking, and problem-solving abilities.

Previous research conducted by Ula, (2019) and Hidayati et al. (2022) found that critical thinking skills improved significantly with the mind-mapping-assisted PBL model compared to the interactive lecture method. Although some studies have demonstrated that PBL and mind mapping can improve critical thinking skills, researchers have conducted limited empirical investigations in geography education, particularly regarding complex problem-solving processes, such as those involved in learning materials on disaster mitigation and adaptation.

Referring to the learning problems identified in class XI F of SMA Negeri 3 Singaraja and the

proposed solution along with its advantages, the objectives of this action research are as follows: analyzing the implementation of the mind mapping-assisted PBL model in geography lessons and enhancing students' critical thinking skills through the application of the mind mapping-assisted PBL model in geography lessons

METODE

This study is a classroom action research (CAR) study. It was conducted at SMA Negeri 3 Singaraja during the even semester of the 2025/2026 academic year, from May to June. The research subjects are 42 students in class XI F, consisting of 18 males and 25 females. The researchers chose this class as the study's subject because preliminary surveys and teacher interviews indicated that students' critical thinking skills in class XI F were still low. This study follows the model design by Kemmis and McTaggart, implementing the procedure in two cycles. Each cycle consisted of four components, namely planning, action, observation, and reflection(Ervina et al., 2023). The researchers carried out the action and observation components simultaneously. Figure 1 shows the study design.

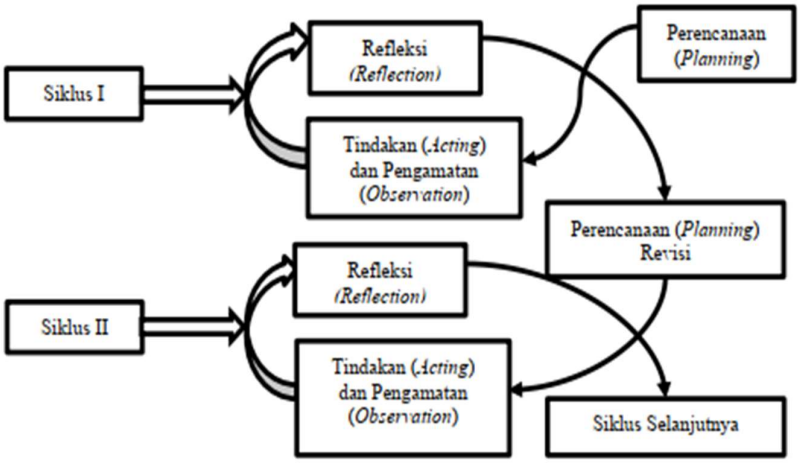

Figure 1. PTK Cycle from Kemmis and Tanggar 2007, Source: Ervina et al.,(2023)

The Planning stage includes the following steps: (1) The teacher determines the material or topics to discussed, (2) Preparing an appropriate Lesson Plan (RPP), (3) Preparing learning media and student worksheets that are appropriate for the material to be delivered, (4) Forming heterogeneous groups of 7 students, (5) Preparing research instruments to assess students' critical thinking skills.

The implementation stage of this action is aligned with the prepared lesson plan (RPP). Each cycle consists of three meetings, namely two learning sessions and one final test.

The Observation/Evaluation stage is conducted to assess students' critical thinking skills. Evaluation activities are carried out throughout the learning process, with evaluation tests given at the end of the cycle. The evaluation covers all teaching and learning activities. Observation and assessment of the actions taken in learning are carried out by recording the obstacles that arise during the activities.

The reflection stage is conducted to review the results of the actions in cycle I. Based on the evaluation results to determine the learning outcomes of students' critical thinking skills in cycle I, more effective solutions are then considered that were in line with the characteristics of the students in order to improve the results of students' critical thinking skills in geography. These alternative actions are applied as new actions in the action plan in the classroom action research cycle II.

Data was collected using the following methods: (1) The observation method was employed to obtain data related to the implementation of the Mind Mapping-assisted PBL model in Geography lessons on mitigation and disaster topics. Data on teacher teaching activities and student learning activities were collected using an observation instrument sheet, which scores activities according to predetermined criteria. (2) The test method was employed to obtain data on students' learning outcomes in critical thinking skills after participating in learning activities using the mind mapping-assisted PBL model. The tests used in this research were essay questions that aligned with the critical thinking skills (CTS) indicators outlined by Ennis in Table 1. Before being used in research, instruments were first

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tested for validity and reliability. Content validity testing was conducted through assessment by two judges competent in the relevant field and analyzed using Gregory's formula. Subsequently, item validity was assessed using the Product-Moment Correlation, and instrument reliability was evaluated using the Cronbach's alpha coefficient.

Table 1. Critical Thinking Skills Indicators

No	Critical Thinking Skills Indicators	Sub-Indicators of Critical Thinking Skills	Question Number
1	Providing Simple Explanations	Focusing questions	1
2	Building Basic Skills	Considering an observation report	2
3	Inference	Inducing and considering the results of induction	3
4	Providing Further Explanation	Identifying assumptions	4
5	Setting Strategies and Tactics	Deciding on the right course of action	5

After all the data in this study were collected, data analysis was conducted. Data analysis was performed using quantitative descriptive methods, which involve analyzing data by describing or depicting the data without making general conclusions or generalizations (Sugiyono, 2019). Data analysis was carried out by presenting the average scores for students' critical thinking skills, the implementation of learning models, and the percentage of students achieving classical mastery.

RESULTS AND DISCUSSION

Research Results

The implementation of the mind-mapping-assisted PBL model affects students' critical thinking activities and outcomes. It is evident from a comparison of conditions before and after the model's application that there is an increase in teacher and student activities and in students' outcomes in critical thinking skills from Cycle I to Cycle II. The following section presents the details.

Table 2. Implementation of PBL Model Assisted Mind Mapping in Cycle I And Cycle II

No	Meeting	Cycle I	Criteria	Cycle II	Criteria
1.	1	74,16	Good	85,83	Very Good
2.	2	78,33	Good	93,33	Very Good
	Mean	76,25		89,58	
Increase of Implementation of PBL Model Assisted Mind Mapping in Cycle I And Cycle II					**17,48%**

Based on Table 2, the results of implementing the PBL model combined with mind mapping techniques in Cycle I and Cycle II showed significant improvement. In Cycle I, the average implementation score reached 76.25 (good). In Cycle II, the score increased to 89.58 (very good). The increase from cycle I to cycle II was 17.48%, indicating that the quality of implementation improved consistently across both student involvement and teacher effectiveness in applying the mind-mapping-assisted PBL model. Details of the implementation of the PBL model syntax, supported by teacher- and student-generated mind maps are presented in Figures 2 and 3 below.

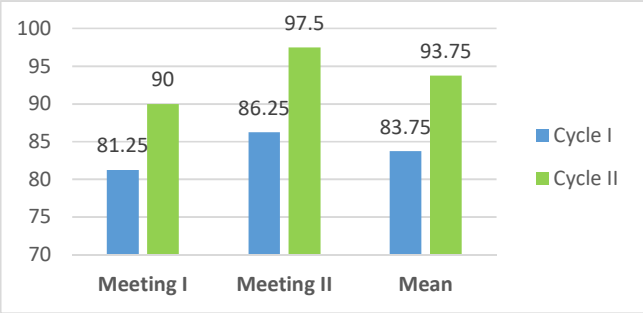


Figure 2. The Teacher's Implementation of the Syntax of the Mind Mapping-Assisted PBL Model

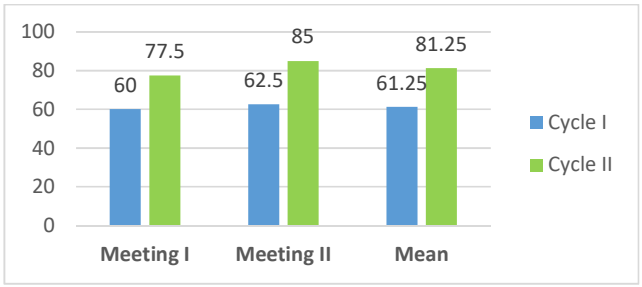


Figure 3. The Student's Implementation of the Syntax of the Mind Mapping-Assisted PBL Model

Based on Figures 2 and 3, the data show that the learning model taught by teachers in each meeting in cycle I achieved average scores of 81.25 and 86.25, which are considered good. In cycle II, these scores increased to 90 and 97.5, which are classified as very good because they exceeded the minimum threshold for successful implementation of the learning model (70). Students' implementation of the learning model syntax in cycle I yielded average scores of 60 and 62.5, which are considered fair. In cycle II, these scores increased to 77.5 and 85, which were classified as good because they exceeded the minimum success threshold.

In addition, the results of students' learning in critical thinking skills in each meeting, based on the student worksheets are shown in Figure 4 below.

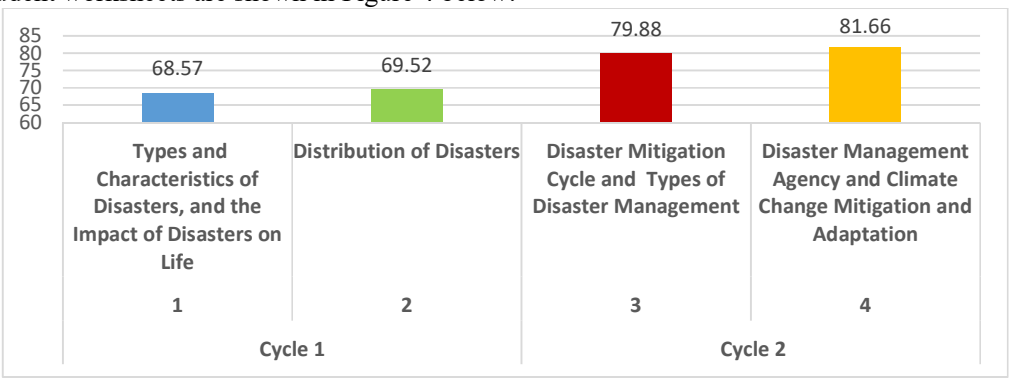
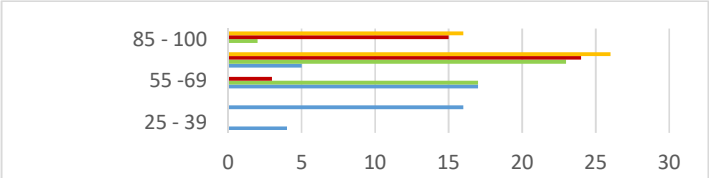


Figure 4. Average Worksheets Scores for Students' Critical Thinking Skills for Each Meeting

Based on Figure 4, the average score on the student worksheets for the critical thinking skills sheet increased at each meeting. The average scores for the first and second meetings of cycle I were 68.57 and 69.52 (moderate). This condition illustrates that the students' skills had not developed optimally. In cycle II, the average scores for the third and fourth meetings increased to 79.88 and 81.66, respectively (high). At this stage, the students' skills began to improve. They were able to identify problems, present rational arguments, draw conclusions from relevant data, identify assumptions, and decide on appropriate actions. The detailed results of total students obtaining critical thinking skills worksheet scores for each meeting are presented in Figure 5



	25 - 39	40- 54	55 -69	70 - 84	85 - 100
Cycle II Meeting 4	0	0	0	26	16
Cycle II Meeting 3	0	0	3	24	15
Cycle I Meeting 2	0	0	17	23	2
Cycle I Meeting 1	4	16	17	5	0

Figure 5. Total Students Obtaining Critical Thinking Skills worksheet Scores for Each Meeting

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Based on Figure 5, the analysis of students' critical thinking skills (CTS) shows an increase in the number of students earning high scores at each meeting. In the first meeting, most students were still in the low to moderate category. Still, in the following meetings, the number of students in the high and very high categories increased consistently until the fourth meeting. It shows that implementing the PBL model, supported by mind mapping media, is effective in gradually and continuously improving students' critical thinking skills throughout the learning process.

Table 3. Students' Classical Mastery in the Pre-Cycle, Cycle I, and Cycle II

No	Mastery of Learning	Pre-Cycle		Cycle I		Cycle II	
		N	%	N	%	N	%
1.	Passing	6	14,28%	17	40,47%	38	90,47%
2.	Failing	36	85,71%	25	59,52%	4	9,52%
Total		**42**	**100%**	**42**	**100%**	**42**	**100%**
Percentage Increase of Students' Classical Completion from Pre-Cycle to Cycle I							**26,19%**
Percentage Increase of Students' Classical Completion from Cycle I to Cycle II							**50%**

Table 3 presents the implementation of the mind-mapping-assisted PBL model in geography learning in Class XI. F at SMA Negeri 3 Singaraja has resulted in an increase in students' classical mastery from 26.19% in the pre-cycle condition to 50% in Cycle I and Cycle II.

Table 4. Results of Students' Critical Thinking Skills (CTS) in the Pre-Cycle, Cycle I, and Cycle II

No	Score Interval	Criteria	Pre-Cycle		Cycle I		Cycle II	
			N	%	N	%	N	%
1.	85-100	Very High	0	0%	2	4,76%	20	47,61%
2.	70-84	High	5	11,90%	19	45,23%	22	52,38%
3.	55-69	Moderate	16	38,09%	20	47,61%	0	0%
4.	40-54	Low	18	42,85%	1	2,38%	0	0%
5.	25-39	Very Low	3	7,14%	0	0%	0	0%
Total			**42**	**100%**	**42**	**100%**	**42**	**100%**
Mean			**53,69**		**68,09**		**83,21**	
Percentage Increase in CTS of Students from Pre-Cycle to Cycle I							**26,82%**	
Percentage Increase in CTS of Students from Cycle I to Cycle II							**22,20%**	

Table 4 shows an increase in the critical thinking skills of grade XI F students at SMA Negeri 3 Singaraja following the implementation of a mind-mapping-assisted PBL model in geography learning. The average score increased from 53.70 (pre-cycle, low) to 69.09 (Cycle I, moderate) and 83.21 (Cycle II, high). The percentage increase in KBK from the Pre-Cycle to Cycle I was 26.82%, and from Cycle I to Cycle II was 22.20%.

The criteria for students' critical thinking skills in each cycle for each indicator can be seen in Figure 6.

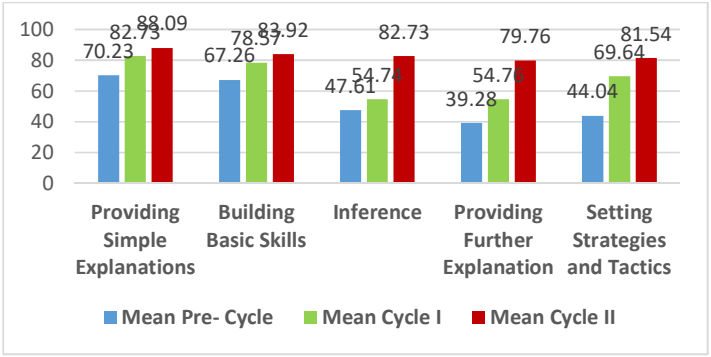

Figure 6. Results for Each Indicator of Students' Critical Thinking Skills

Based on Figure 6 above, critical thinking skills in students in cycle I and cycle II improved in terms of providing simple explanations, building basic skills, Inference, providing further explanations, and organising strategies and tactics. Therefore, students demonstrated improvement across all indicators of critical thinking.

Discussion

Cycle I actions were carried out in two meetings conducted by the geography teacher of SMA Negeri 3 Singaraja and the researcher, with the main topics being disaster concepts, types, characteristics, impacts on life, and the distribution of disaster types in Indonesia. The first meeting took place on Friday, May 16, 2025, during the 3rd-4th lessons, and the second meeting on Monday, May 19, 2025, during the 8th-10th lessons. Cycle II actions were conducted in two meetings with the same teacher, namely on Monday, May 26, 2025, and Monday, June 2, 2025. The main topics included types of disaster management, disaster management institutions, mitigation, and climate change adaptation.

Based on Table 1, the implementation of the mind mapping-assisted PBL model in geography learning during Cycle I was rated "good," with an average score of 76.25. In Cycle II, the implementation of learning improved significantly, reaching the "very good" category with an average score of 89.58. Nevertheless, the implementation of the PBL model assisted by mind mapping in Cycle I had not yet been carried out optimally. It was reflected in the students' learning activities, which was evidenced by the lack of enthusiasm shown by some students during the learning process. The students still appeared confused, as they were not yet familiar with the learning model applied—namely, the mind mapping-assisted PBL model—so they had not been able to adapt to it well. During discussion and presentation activities, some students tend to chat about topics unrelated to the discussion. It occurred due to several obstacles found in the actions of Cycle I as follows: (1) students are still accustomed to a conventional, passive learning approach, where they tend to wait for information from the teacher and listen, (2) students do not yet have the habit of working collaboratively in groups, especially because the groups formed are heterogeneous, which requires higher adaptability and communication skills, (3) students' abilities to discuss and conduct demonstrations independently are still limited. it was caused by the dominance of individual lecture methods in previous learning, which did not provide space for students to actively engage in dialogue or solve problems together, (4) On the other hand, classroom management by the teacher is not yet fully optimal, resulting in a classroom atmosphere that is sometimes less conducive and scheduling that often does not align with the planned timetable.

Based on these obstacles, efforts were made to improve the implementation of actions in Cycle II through the following steps: (1) Before implementing the actions in Cycle II, the teacher provided clearer instructions by reiterating the steps of the mind mapping-assisted PBL model, as well as the aspects of its implementation and assessment. Students were also directed to be more active and responsible for the success of the group, so that learning is expected to proceed more optimally, (2) manage time allocation more proportionally in each stage of the learning model and optimize classroom management, (3) enhance interaction between teachers and students during activities, monitor student discussions by circulating, observing, and guiding groups that face difficulties or do not cooperate in completing the worksheets, to prevent student dominance and ensure everyone is involved, provide clearer directions on the steps of creating a mind map, (4) organize group distribution more evenly according to students' abilities, (5) formulate challenging starter questions to stimulate critical thinking and provide motivation for each student to actively participate in discussion activities.

Conversely, the implementation of the mind mapping-assisted PBL model in Cycle II showed significant improvement and was carried out optimally. The increase in teacher activity reflects better teaching strategies, as well as the ability to create a structured, focused, and conducive environment for the mind mapping-assisted PBL model.. Simultaneously, students also began to show good adaptation to this learning model, as evidenced by their increased activity compared to cycle I, with an average score of 81.25 (High). Most students have carried out each stage of the learning activities optimally. All group members actively participated in the investigative process, engaged more actively in group discussions, asked questions, and solved problems independently. The implementation of the mind-mapping activity also ran smoothly, without haste, allowing students enough time to express their ideas in their respective mind maps independently. This condition indicates that active student involvement is positively correlated with a deeper understanding of the material and the improvement of critical thinking skills in problem-solving. Through PBL, students are not only guided to recall information but also trained to analyze, evaluate, and apply knowledge in real-world contexts, ultimately enriching their learning experience (Rachman et al., 2025). In line with this finding, the research by Chueh & Kao, cited in Rachman et al. (2025), , suggests that students engaged in PBL exhibit higher levels of

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participation and activity. The increase in student engagement from Cycle I to Cycle II in this study provides evidence that the mind mapping-assisted Problem-Based Learning (PBL) model effectively encourages students to explore solutions in depth and construct understanding collaboratively within groups. Consequently, the learning process in Cycle II was more meaningful and optimal, directly resulting in a significant improvement in students' critical thinking skills.

The enhancement in the successful implementation of the mind mapping-assisted PBL model from Cycle I to Cycle II was supported by several factors, primarily the teacher's role. The teacher begins the lesson by clearly explaining the flow of activities and capturing students' attention with visual cues and videos. Such stimuli can motivate students to follow the teacher's instructions more closely, thereby enhancing the quality of lesson delivery. According to Casmini Casmini, (2020), mind mapping can make learning more engaging, enjoyable, and motivating for students. The teacher's role as a facilitator is crucial in creating a conducive learning environment and encouraging student engagement. When teachers perform this role optimally, learning effectiveness will also improve. Additionally, from the students' perspective, consistent stimulation can foster the development of positive new habits. This habit shapes more automatic, long-lasting behaviors, allowing students to understand better and become accustomed to the learning process using the PBL model assisted by mind mapping. Progress in learning implementation is not only determined by supporting factors. Still, it is also a consequence of evaluation and reflection conducted in each cycle, which helps formulate improvements for the next stage (Arikunto, 2018). Effective learning implementation is a key success factor, while imperfections in the process will hinder achieving optimal results.

To assess the effectiveness of the learning process, data on students' critical thinking skills were collected through tests administered at the end of each learning cycle. Before carrying out the learning activities, students first take a pretest to determine their initial abilities in critical thinking related to disaster mitigation and adaptation material. The pretest results showed that students' initial skills were still low and had not reached the expected level. After implementing the mind mapping-assisted model in cycles I and II, a posttest was conducted to assess students' critical thinking skills. when viewed against the average score for critical thinking skills in Cycle I, students' average score was 68.09 (moderate). The following are the findings from Cycle I: students' critical thinking skills have developed optimally in providing simple explanations and in building basic analytical skills. However, this ability was not yet fully optimal in concluding, giving further explanations, or designing strategies and tactics. It shows that students were beginning to understand problems and could classify basic information, but were not yet consistent in engaging in higher-level thinking. Based on these findings, it became clear that improvements were needed in Cycle II. The upgrades made had a significant effect on students' critical thinking skills. In cycle II, the average critical thinking skills score for students increased to 83.21 (in the high category). The findings in cycle II were as follows: All indicators of students' critical thinking skills increased significantly compared to cycle I. The indicators were as follows: providing simple explanations increased from 82.73 to 88.09; building basic skills rose from 78.57 to 83.92; concluding increased from 54.76 to 82.73; providing further explanations in sequence increased from 54.76 to 79.76; organizing strategies and tactics increased from 69.64 to 81.54. Meanwhile, the study was considered successful in terms of improving Geography learning outcomes if the students' classical completeness reached at least 75%. Based on the data analysis, the implementation of the PBL model combined with mind mapping proved effective in enhancing students' critical thinking skills, exceeding the predetermined standard. In Cycle I, students' classical completeness reached only 40.47%, but it showed a significant improvement in Cycle II, gaining 90.47%.

The enhancement of students' critical thinking skills in each learning cycle using the mind-mapping-assisted PBL model occurred because this model provides ample opportunities for students to participate in collaborative inquiry and problem-solving through active group discussions. During the learning process, students are not only positioned as information recipients but are also trained to explore, analyze, and solve contextual problems presented by the teacher. These contextual problems encourage students to think more deeply, logically, and systematically. Ersoy & Başer (2014) argue that the PBL learning model provides students with opportunities to develop their critical thinking skills through active engagement in problem-solving processes within small discussion groups. This process can enhance students' abilities in analysis, interpretation, evaluation, inference, and explanation. In addition, using mind maps as a concept visualization tool helps students organize and analyze essential

ideas and information, connect concepts, and clarify the flow of their thinking, thereby deepening their understanding and analytical skills. The creation of Mind Maps as visual representations of concepts helps students organize and identify essential ideas and information, connect concepts, and clarify their thought processes, thereby facilitating deeper understanding and better analysis. This finding aligns with those of Takus et al. (2021), who reported that integrating mind mapping into the Problem-Based Learning model helps students organize information more structurally, thereby improving their analytical skills. Furthermore, the findings of Novita et al. (2019) reinforce that integrating Problem-Based Learning with visual media, such as Mind Mapping, can improve the quality of arguments, the ability to conclude, and student engagement in discussions. In addition, mind mapping-assisted learning can enhance students' classroom engagement by increasing their interest and motivation to learn (Sumitadewi et al., 2022). The integration of problem-solving through PBL and information organization using mind mapping helps students become more focused in identifying problems, formulating various alternative solutions, and drawing logical conclusions. Therefore, this combination fosters a gradual improvement in critical thinking skills in each cycle. Considering the observed improvements in students' critical thinking across each cycle, as previously described and supported by prior research, the mind-mapping-assisted PBL model is efficacious in enhancing students' critical thinking in geography lessons.

CONCLUSION

Based on the research that has been conducted, the following conclusions can be drawn. The implementation of the mind mapping-assisted PBL model in geography lessons in cycle I was rated good (average 76.25), and in cycle II, very good (average 89.58). The results of critical thinking skills of grade XI F students at SMA Negeri 3 Singaraja after the implementation of the Mind Mapping-assisted Problem-Based Learning model showed an increase in each cycle. In the first cycle, the average critical thinking skills of students reached 68.09, with a classical mastery level of 40.47%. After improvements in the second cycle, the average essential thinking skill increased to 83.21, with a classical mastery level of 90.47%.

Given the challenges in implementing the PBL model supported by mind mapping, it is recommended that teachers provide more intensive guidance to students, especially during problem formulation, group discussion, and mind map creation. It is essential, given that there are still fewer active students who are not yet accustomed to critical thinking and have difficulty expressing their opinions and organizing concepts systematically. In addition, teachers need to manage learning time more effectively and provide clear, gradual examples of mind mapping to minimize obstacles to its implementation. For future researchers, it is recommended to develop research by combining PBL with digital mind mapping and applying it across different subjects and educational levels to obtain more comprehensive results.

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REFERENCE

Abdullah, & Munawwaroh, F. (2024). Problem Based Learning Untuk Meningkatkan Keterampilan Berpikir Kritis Siswa. 10(1), 155–162.

Amin, S. (2017). Pengaruh Model Pembelajaran Problem Based Learning Terhadap Kemampuan Berpikir Kritis Dan Hasil Belajar Geografi. Jurnal Pendidikan Geografi, 4(3), 25–36. https://doi.org/10.58578/tsaqofah.v2i1.253

Arikunto, S. (2018). Dasar -Dasar Evaluasi Pendidikan, Edisi 3. Bumi Aksara.

Astuti, N. P. S., Astawa, I. B. M., & Suryadi, M. (2013). Pengaruh Model Pembelajaran Kontekstual (CTL) terhadap Keterampilan Berpikir Kritis Siswa dalam Pembelajaran Geografi pada Kelas X di SMA Negeri 4 Singaraja. Jurnal Pendidikan, 1, 1–10.

Casmini, N. L. (2020). Penerapan Metode Mind Mapping Untuk Meningkatkan Motivasi dan Hasil

ISSN 2963-7856 (print), ISSN 2961-9890 (online)

Belajar Kimia Siswa Kelas XII MIPA 1 SMAN 2 Busungbiu. Jurnal Ilmiah Pendidikan Profesi Guru, 3(1), 193–201. https://doi.org/10.23887/jippg.v3i1.28245

Emanet, E. A., & Kezer, F. (2021). The effects of student-centered teaching methods used in mathematics courses on mathematics achievement, attitude, and anxiety: a meta-analysis study. Participatory Educational Research, 8(2), 240–259. https://doi.org/10.17275/PER.21.38.8.2

Ennis, R. H. (2011). The Nature of Critical Thinking. Informal Logic, 6(2), 1–8. https://doi.org/10.22329/il.v6i2.2729

Ersoy, E., & Başer, N. (2014). The Effects of Problem-based Learning Method in Higher Education on Creative Thinking. Procedia - Social and Behavioral Sciences, 116, 3494–3498. https://doi.org/10.1016/j.sbspro.2014.01.790

Ervina, A., Suharto, Y., & Rahmawati, R. (2023). Penerapan Model Problem Based Learning untuk Meningkatkan Kemampuan Berpikir Kritis Siswa Kelas X. 01(2), 64–78. https://doi.org/10.69606/geography.v1i2.60

Harahap, L. J., Ristanto, R. H., & Komala, R. (2020). Assesing Critical Thinking and Mastery Concepts: The case of Ecosystem Material. Edusains, 12(2), 223–232.

Hidayati, N., Zubaidah, S., & Amnah, S. (2022). The PBL vs. Digital Mind Maps Integrated PBL: Choosing Between the two with a view to Enhance Learners' Critical Thinking. Partipatory Educational Research, 9(3), 3181–3190. https://doi.org/10.17275/per.22.69.9.3

Hikayat, C., Suparman, Hairun, Y., & Suharna, H. (2020). Design of realistic mathematics education approach to improve critical thinking skills. Universal Journal of Educational Research, 8(6), 2232–2244. https://doi.org/10.13189/ujer.2020.080606

Kong, L.-N., Qin, B., Zhou, Y., Mou, S., & Gao, H.-M. (2014). A Comparative Review of India and USA's Approach to Brownfield Redevelopment. International Jurnal of Nursing Studies, 51, 458–469. https://doi.org/10.1016/j.ijnurstu.2013.06.009

Nadila, N., & Sitompul, S. (2021). Pengaruh Model Pembelajaran Problem Based Learning Terhadap Peningkatan Kemampuan (the Influence of Problem Based Learning Learning Models. 04(01), 45–54.

Novita, D., Bukit, N., & Sirait, M. (2019). The Effect of Problem-Based Learning Models Using Mind Map to Improve Critical Thinking and Problems Solving Skill of Student. 200, 17–21. https://doi.org/10.2991/aisteel-18.2018.4

Octavia, S. A. (2020). Model- Model Pembelajaran. Deepublish.

OECD. (2023). PISA 2022 Results (Volume I). OECD Publishing.

Rachman, B., Wibowo, S. E., Kawuryan, S. P., Maharani, M., Aprilia, & Zakariyah, Y. A. (2025). The Use of Problem-Based Learning Model to Improve Integrated Thematic Learning Outcomes. Jurnal Pedagogi Dan Pembelajaran, 8(1), 187–193. https://doi.org/10.23887/jp2.v8i1.87028

Redhana, I. W. (2019). Mengembangkan Keterampilan Abad Ke-21 Dalam Pembelajaran Kimia. Jurnal Inovasi Pendidikan Kimia, 13(1).

Rosciano, A. (2015). The effectiveness of mind mapping as an active learning strategy among associate degree nursing students. Teaching and Learning in Nursing, 10(2), 93–99. https://doi.org/10.1016/j.teln.2015.01.003

Septiany, L. D., Puspitawati, R. P., Susantini, E., Budiyanto, M., Purnomo, T., & Hariyono, E. (2024). Analysis of High School Students' Critical Thinking Skills Profile According to Ennis Indicators. IJORER : International Journal of Recent Educational Research, 5(1), 157–167. https://doi.org/10.46245/ijorer.v5i1.544

Septikasari, R. ;Rendy N. F. (2018). Keterampilan 4C Abad 21 Dalam Pembelajaran Pendidikan Dasar. Jurnal Tarbiyah Al- Awlad, 3(2), 107–117. https://doi.org/10.1016/j.jacc.2020.04.015

Suarsini, N. W. D., Wesnawa, I. G. A., & Kertih, I. W. (2020). Pengembangan Media Pembelajaran Geografi Berbasis Media Sosial Instagram untuk Peningkatan Motivasi dan Hasil Belajar Siswa. Jurnal Pendidikan IPS Indonesia, 4(2), 72–81. https://doi.org/10.23887/pips.v4i2.3386

Sugiyono. (2019). Metode Penelitian Kuantitatif Kualitatif dan R&D. Alfabeta Bandung.

Sumitadewi, N. L. S. N., Wesnawa, I. G. A., & Astawa, I. B. M. (2022). Penggunaan Model Kooperatif Tipe STAD berbantuan Media Mind Mapping terhadap Aktivitas dan Hasil Belajar IPS Siswa SMP Negeri 3 Sukawati. Media Komunikasi FPIPS, 21(2), 141–153. https://doi.org/10.23887/mkfis.v21i2.49617

Takus, Y. M., Sunarno, W., & Wahyuningsih, D. (2021). The Critical Thinking Skills of High School

with Problem-Based Learning Model-Assisted Mind Map in Online Learning on Dynamic Fluid. Proceedings of the Second Asia Pacific International Conference on Industrial Engineering and Operations Management Surakarta, 3181–3190.

Ula, W. R. R. (2019). Pengaruh Problem Based Learning dengan Mind Mapping Terhadap Keterampilan Berpikir Kritis. Jurnal BELAINDIKA (Pembelajaran Dan Inovasi Pendidikan), 1(2), 1–11. https://doi.org/10.52005/belaindika.v1i2.13

Windura, S. (2013). 1st Mind Map untuk Siswa, Guru, dan Orang Tua. PT Elex Media Komputindo.

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