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OPTIMIZING GEOGRAPHY LEARNING THROUGH THE PROBLEM BASED LEARNING MODEL ASSISTED BY PADLET MEDIA TO ENHANCE STUDENT LEARNING OUTCOMES IN ATMOSPHERE MATERIAL

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Abstract

The aim of this study is to improve students' learning outcomes on the topic of the atmosphere by implementing the Problem-Based Learning (PBL) model supported by Padlet media in Class X-F of SMA Negeri 1 Probolinggo. The study discusses low student participation and poor learning outcomes in geography, particularly on the atmosphere topic, which is often considered challenging. A Classroom Action Research (CAR) design was employed, conducted in two cycles comprising planning, action implementation, observation, and reflection phases. Moreover, data were collected through observation, documentation, and learning outcome tests, and analyzed by using descriptive quantitative methods. The study shows a significant improvement in students' learning outcomes. The average score increased from 56 in the pre-cycle to 79 in the first cycle and 88 in the second cycle. Similarly, the percentage of students achieving mastery increased from 11% in the pre-cycle to 74% in the first cycle and 86% in the second cycle. Furthermore, the combination of PBL and Padlet media effectively enhanced student engagement, participation, and understanding of the atmosphere topic. Therefore, it can be concluded that implementing PBL with Padlet created a more engaging and effective geography learning environment while fostering students' critical thinking and problem-solving skills. These results suggest that interactive media like Padlet can be an essential tool in modern educational practices, particularly for complex subjects such as geography.

Keywords: Learning Outcomes, Problem-Based Learning, Padlet

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INTRODUCTION | مقدمة

Geography is often considered as a subject which emphasizes memorization, but studying geography actually requires conceptual understanding and analytical skills in order to delve deeper into the material (Marissa, 2017). Geography not only includes an understanding of locations and place names, but it also involves an understanding of the processes which influence various phenomena on the earth's surface; such as, the dynamics of the atmosphere, lithosphere, hydrosphere, and interactions between humans and the environment (Yani & Rahmat, 2007). Nowadays, geographical knowledge is very important to enhance students' understanding of the relationship between the environment, society, and economy (Kusumawati et al., 2023). Meanwhile, problems in learning geography often arise due to material which involves interactions between natural phenomena and human activities. Widiastuti (2017) emphasized that the interaction between the atmosphere, lithosphere, and hydrosphere in geographical phenomena; such as, floods, climate change, or urbanization, is a major challenge for students

with difficulty understanding the cause-and-effect relationships between these processes and students' interactions with everyday human activities. In addition, Soekamto & Handoyo (2022) stated that understanding the dynamics of geography required learning steps with student support in order to think analytically and relate the concepts learned to real situations.

The success of geography learning depends on various aspects which influence the achievement of student learning outcomes. Success in learning can be seen from the learning that takes place (Miranda, 2018). The teacher acts as the main facilitator who is responsible for ensuring the continuity of effective learning, which will be reflected in student learning outcomes. In addition, Allam & Bramasta (2023) explain how internal and external influences affect participant learning. Internal elements include prior knowledge, intelligence, abilities, interests, and motivation. External variables include the learning environment, teaching techniques, curriculum, and supporting facilities.

The quality of teacher learning greatly affects student learning. Without student participation, learning outcomes will be poor (Prabowo, 2021). Therefore, teachers must innovate by choosing a learning approach which motivates and engages students (Rosa et al., 2024). A creative and interactive learning approach can engage and challenge students (Pertiwi et al., 2022). In addition, collaboration between teachers and students is the key to successful effective learning since students will feel more appreciated and motivated to learn.

Observation results in class X-F SMA Negeri 1 Probolinggo show poor geography learning outcomes. Inadequate student participation in learning is the main factor. It emphasizes the need for changes in teaching models in order to motivate and engage students in learning. Student-centered Problem Based Learning (PBL) is a useful option since it trains students to solve problems. Student-centered Problem Based Learning (PBL) is a useful option since it trains students to solve problems, think critically, and increase student engagement during learning.

PBL teaches participants to describe and solve real-life situations. Furthermore, PBL helps students remember ideas and solve problems by recognizing problems, analyzing data, and finding the right answers (Muis, 2019). In addition to increasing engagement, the PBL model strengthens students' analytical skills (Rasto & Pradana, 2021), which are very important in understanding geography material; such as, atmospheric dynamics. Furthermore, Wayudi et al. (2020) stated that to understand concepts; such as, wind movement, weather changes, and the influence of sunlight, students need in-depth analytical skills to understand interrelated geographical phenomena. In addition to PBL, choosing the right learning media contributes to the success of the learning process. Sunaengsih (2016) suggests using interactive and relevant media to engage students and motivate them to learn. The learning media used is Padlet. Students can interact, share, and communicate on Padlet (Nikmatussolihah & Wahyudi, 2024). Padlet also makes it easier for teachers to manage learning so that it becomes more dynamic and interactive.

Technological advances in education have brought about various innovations to enhance the quality of learning. One relevant technology is Padlet, which allows students to collect, organize, and deliver information in an engaging way. Furthermore, Astuti et al. (2022) showed that collaborative learning by using Padlet enhances students' creativity and writing skills. Padlet collects assignments, presentations, and group discussions in order to improve student learning (Fitriani, 2021). Padlet encourages student engagement so that it improves learning outcomes (Nurmi et al., 2023).

Several previous studies have discussed the use of Problem-Based Learning (PBL) in

improving students' critical thinking skills (Dewi, 2020). In addition, other studies have shown that interactive media such as Padlet can increase student engagement in learning (Widoty & Wicaksana, 2024). However, research examining the integration between PBL and Padlet in the context of geography learning; especially, in atmospheric dynamics material is still limited. Most studies only focus on the effectiveness of each method separately, without looking at how the two can be combined to improve student learning outcomes more optimally.

In this study, the combination of the PBL model and the use of Padlet is expected to increase student participation and learning outcomes; especially, in the material on atmospheric dynamics. It is conducted since geography learning which still tends to be based on memorization hinders students' understanding of concepts and analytical skills. In fact, geography requires students to understand the relationships between phenomena and analyze the dynamics which occur in the surrounding environment (Utami et al., 2021). Therefore, this study is important to overcome this problem by presenting a more interactive, contextual, and problem-solving-based learning approach. The integration of Problem Based Learning (PBL) with interactive media such as Padlet is expected to increase student involvement in the learning process, train students to think critically, and connect geographical concepts with the realities of daily life (Suriyanisa et al., 2024). In addition, the results of this study contribute to enriching references for innovative learning models which can be used by educators in order to improve the effectiveness of geography learning in the digital era.

METHOD | منهج

The study was conducted at SMA Negeri 1 Probolinggo on Jalan Soekarno-Hatta Number 137, Curahgrinting, Kanigaran District, Probolinggo City, East Java. The subjects were 35 students of class X-F. The research activities took place during April 2024 with a duration of five weeks, conducted every Tuesday according to the geography lesson schedule for class X-F. In order to foster student learning outcomes, various tools and materials were used to support the learning process. One of the media used was Padlet, a digital platform designed for collaboration. Through Padlet, students can share ideas, discuss, and collect information relevant to atmospheric material. Furthermore, padlet was used as a medium to help the learning process and as a place for students to collect assignments. In addition, researchers provide online worksheets containing questions and problems related to the material being taught. Additional materials prepared include lesson plans, essay questions, and online worksheets integrated with Padlet. Researchers also prepare presentation materials by using PowerPoint and reading materials about the atmosphere in order to help students understand the concept more deeply.

The characteristics of students in this class reflect the diversity of levels of understanding and interest in geography subjects. Students in class X-F were chosen as research subjects since students have received the basics of atmospheric material in the previous curriculum so that allowing for clearer measurements of the improvement in learning outcomes after the application of Padlet media in problem-based learning. Moreover, this study was conducted in only one class, namely X-F, considering that this class has a geography learning schedule which allows for consistent implementation of the method for five weeks. In addition, the use of one class as a sample also considers aspects of limited time and resources in conducting the study. Although the results of this study provide insight into the effectiveness of Padlet in improving student learning outcomes, the limited sample in one class can affect the generalization of the research results.

This study used Classroom Action Research (CAR) with a cycle approach in order to overcome student learning difficulties and improve the quality of geography learning. Each cycle consists of four main stages, namely planning, action, observation, and reflection. This research model referred to the concept developed by Arikunto et al. (2015), which emphasizes the process of repeated cycles to improve learning based on the results of reflection. The model can be seen in Figure 1 as the basis for implementing this research.

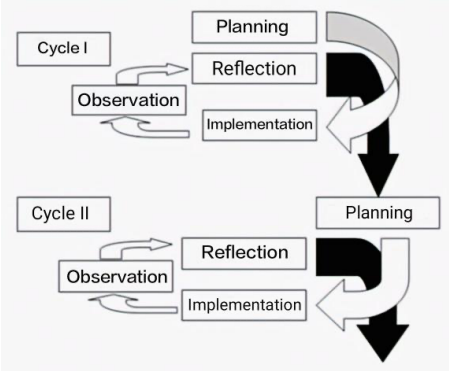

Figure 1. CAR Flowchart

Data were collected through various instruments in order to ensure the accuracy of the results. Primary data were obtained from direct observation of student activities in using Padlet during Problem Based Learning (PBL)-based learning, student answers to essay questions given through Padlet and bold worksheets, and documentation of activities, including photos during the learning process in order to observe student involvement and interaction. In addition, secondary data were obtained from related literature, academic documents, and relevant sources which support the analysis in this study.

The questions used in the study were classified based on cognitive levels in Bloom's Taxonomy, starting from C1 (Remembering) which includes questions about the definition and basic concepts of the atmosphere, C2 (Understanding) which asks students to explain atmospheric phenomena based on the information collected, C3 (Applying) which encourages students to use meteorological data in simple analysis, C4 (Analyzing) which compares factors that influence climate and weather, to C5 (Evaluating) and C6 (Creating) in cycle II, which require students to make critical conclusions and provide solutions to the given atmospheric problems. These questions are arranged in stages to measure the development of students' understanding from pre-cycle, cycle I, to cycle II.

In order to ensure the validity and reliability of the data, this study implemented several steps. Instrument validation was conducted by two geography education experts to ensure the suitability of the questions with the learning objectives and cognitive levels. Furthermore, an inter-rater reliability test was conducted, in which two independent examiners assessed students' answers based on the agreed assessment rubric. If there was a significant difference in scores, a discussion was held until a final agreement was reached. In addition, the study implemented method triangulation that was comparing the results of observations, documentation, and essay question analysis in order to ensure data consistency.

In cycle I, students learned the concept of humidity and air temperature through PowerPoint presentations. After that, they were divided into 7 groups of 5 people each to collect information related to weather and climate using Padlet. After completing the information collection, students worked on essay questions designed to evaluate their level of understanding.

By utilizing Padlet, students can read and access information collected by other groups so that broadening their horizons collectively. This group-based learning aims to improve students' social and communication skills. In cycle II, students were given more complex challenges, such as analyzing educational videos from YouTube which had been integrated into Padlet and reading additional materials. They were also asked to complete case studies related to atmospheric phenomena and their impacts on daily life. With this systematic approach, the study is expected to provide a more accurate picture of the effectiveness of Padlet-based Problem Based Learning (PBL) in improving students' understanding and learning outcomes.

Data analysis in this study used a quantitative descriptive method in order to assess student learning outcomes based on individual and classical completion levels. Moreover, data were analyzed by calculating the percentage of students who achieved the Minimum Completion Criteria (KKM), which was set at ≥ 78 at SMA Negeri 1 Probolinggo.

Individual completion analysis was conducted by calculating the percentage of scores obtained by students compared to the maximum score using the formula:

Individual completion formula

a. Individual completion if the student obtains a score ≥ 78.

$$\mathrm{IC} = \frac{score\ obtained}{maximum\ score} \times 100$$

Note: KI= Individual completion (Trianto, 2007).

b. Classical completeness formula

Classical completeness if ≥ 85% (Trianto, 2011) of all students at individual completeness ≥ 78.

$$\mathrm{CC} = \frac{\sum \text{students completed}}{\sum \text{all students}} \times 100\%$$

Students are considered to have met the learning completion if they achieve a score which is equal to or higher than the Minimum Completion Criteria (KKM). Conversely, students who obtain scores below the KKM are considered not to have achieved completion. In SMA Negeri 1 Probolinggo, the KKM for geography subjects is set at a score of ≥ 78.

The success of classical learning is assessed based on the average class score or those that achieve the KKM. Learning is said to be classically successful if the average class score exceeds the KKM, with a minimum of 85% of all students obtaining a score of ≥ 78. Thus, overall learning completion is achieved if most students are able to meet the KKM which has been set so that the learning objectives are considered successful.

RESULT | نتائج

Based on the research conducted during two cycles, there is an increase in the learning outcomes of class X-F students of SMA Negeri 1 Probolinggo in the material on the characteristics and phenomena of the atmosphere. This increase can be observed through a comparison of student scores, both individually and on a class average, after the implementation of the learning model.

Table 1. Learning Outcomes of Class X-F

No	Learning Outcome	Pre-Cycle	Cycle	
			I	II
1	Minimum Score	35	60	75
2	Maximum Score	85	90	95
3	Range	50	30	20
4	Average	56	79	88

Based on the data in Table 1, there is a significant increase in student learning outcomes in each cycle. This increase shows the effectiveness of the application of the Problem Based Learning (PBL) model supported by Padlet media in geography learning; especially, in atmospheric material. In the pre-cycle stage, the average student score is still relatively low that are 56 with a minimum score of 35 and a maximum of 85. After the application of PBL in cycle I, the average score increased to 79 with a minimum score increasing to 60 and a maximum score reaching 90. This increase shows that the PBL method can help students better understand the material through problem solving and interactive discussions using Padlet. In addition, in cycle II, the average student score increased again to 88 with a minimum score of 75 and a maximum of 95. Therefore, it shows that students increasingly understand atmospheric material which shows the success of the applied learning model.

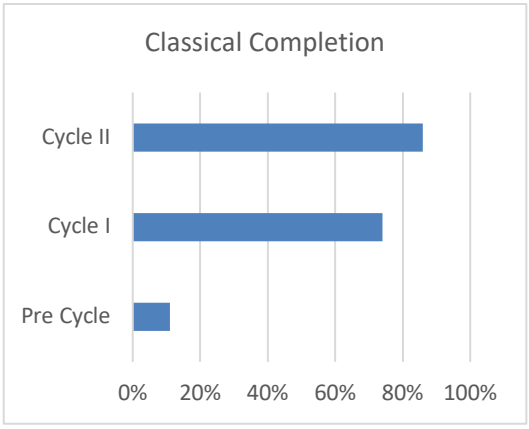

Figure 5. Classical Completion Class X-F

In addition to the increase in average scores, the percentage of student learning completion experienced a significant increase in each cycle. In the pre-cycle stage, only 11% of students achieved learning completion or obtained scores according to the KKM (≥ 78). After the implementation of PBL assisted by Padlet in cycle I, the percentage of completion increased drastically to 74%, which means that most students have achieved the set standards. Furthermore, in cycle II, learning completion increased again to 86% which indicates that almost all students have achieved the expected minimum score. This increase shows that the combination of PBL and Padlet not only helps improve conceptual understanding, but it also motivates students to be more active in learning.

DISCUSSION | مناقشة

Based on the results of the study above, teachers play a role in the success of student learning; especially, in the field of Geography which requires in-depth understanding and analysis. The role of teachers as effective facilitators will greatly affect the way students understand complex concepts and they are able to connect theories with real-life phenomena (Lumuan et al., 2023). Furthermore, according to Dakhi (2020), a qualified teacher should be able to master the material, understand the characteristics of students, and have good

communication skills in delivering the material. In addition, teachers need to understand ways which can enhance students' enthusiasm for learning (Wulandari & Nisrina, 2020). With high motivation, students can be motivated when studying the material in depth (Rahmiati & Azis, 2023). These abilities are very important so that students can understand the concepts taught effectively.

Understanding the concept of geography learning is important to direct students in connecting the material being studied with students' real lives. It is in line with research which had been conducted by Tualepe et al. (2024) that is by understanding the concepts in geography learning, students will be able to understand the goals and benefits of the material being studied since the material is relevant to the lives and environment around the students; for example, in the atmosphere material, students should understand various natural phenomena and the impact of human activities on the environment. Meanwhile, according to Marissa et al. (2024) understanding the concept not only adds to students' knowledge, but it also supports students to be more involved in environmental discussions which are relevant to daily life. Putri et al. (2024) added that through geography learning, students can understand the complexity of the interaction between humans and nature. With this understanding, students will have more awareness of environmental issues.

Not all students understand geography material quickly. Maani (2016) advised students who have not met the Minimum Completion Criteria (KKM) to seek help. Student guidance includes intellectual and emotional assistance (Damanik, 2024). Support motivates and improves learning for students who are having difficulties (Unaenah et al., 2023). Thus, suggestions must improve student learning. Teaching using learning models has successfully improved students' understanding and abilities.

PBL has improved the learning of grade X-F students on challenging atmospheric content at SMA Negeri 1 Probolinggo. Interactive learning material; such as, Padlet also improve student understanding. Padlet allows students to collaborate on ideas, views, and facts. Padlet increases student engagement and creates a more dynamic learning environment (Azisi & Sulaiman, 2020). Padlet media allows children to learn freely and contribute. Media which engages students improves learning. Moreover, Aristin et al. (2023) found that unique and innovative learning methods; such as, Padlet can engage students in atmospheric content. Padlet allows students to explore their knowledge and collaborate with peers. Students are more engaged in topics when the learning environment is more dynamic and interesting. Students learn better and they are more motivated in a good learning environment (Hamdayama, 2022). Padlet is great for interactive and collaborative learning. Effective learning requires a comfortable classroom environment. In addition, Mabnunah et al. (2024) emphasized that learning media helps create a learning-friendly classroom. Padlet allows students to engage in debates and exchange information with peers. Active involvement improves students' understanding, communication, and cooperation (Rahayu, 2023).

Problem-based learning (PBL) and the use of interactive media in education are in line with existing theories. PBL can actively engage students in solving real-world problems, has been shown to be effective in developing students' social and cognitive skills, as explained by Syamsudin (2020) the theory supports research findings showing that PBL not only improves understanding of the material, but it also improves social skills and cooperation among students. According to Sari & Rosidah (2023), Problem Based Learning (PBL) can enhance students' social skills since it is student-centered. Research which had been conducted by Wardani research (2023) showed that PBL can help students collaborate, exchange ideas, and solve problems. PBL

involves students at every level of learning which makes them feel more involved (Zalfa et al., 2023). Understanding material in a real-life context is essential for students to be able to solve problems (Ayuningtyas & Irawan, 2024). Therefore, cooperation is needed so that students can improve their problem-solving skills and student participation, PBL works well.

The application of PBL in geography learning not only helps students understand the material, but it can also improve cooperation between students. Furthermore, Lestari (2023) stated that Problem-Based Learning (PBL) can improve student learning and teamwork. In addition, PBL is considered an effective method in teaching the curriculum comprehensively and helping to develop students' social skills, as explained by Setiawan et al. (2024). The social skills acquired by students through PBL will be very useful throughout their lives; especially, in the workplace, where collaboration and communication are important (Sakiinah et al., 2022). Rahmiati and Azis (2023) also added that these social skills enable students to work together and communicate effectively, even in difficult situations. In addition, PBL provides opportunities for students to think critically, solve problems independently, and interact with other students in completing group assignments. Therefore, PBL not only focuses on academic aspects, but it also plays an important role in building the interpersonal skills needed by students to face future challenges.

Teachers can utilize the PBL approach by designing a learning process which can create contextual learning situations that are relevant to students' lives. By proposing problems related to the students' environment, teachers can encourage students to be more active in critical thinking and solving problems independently or in groups (Aini et al., 2022). In addition, the use of interactive media such as Padlet can be used to encourage collaboration and discussion between students (Patmanthara et al., 2024). Through Padlet, students can share ideas, record student findings, and provide feedback to each other on an easily accessible platform. Teachers can use Padlet in order to improve classroom dynamics, provide space for students to interact actively, and develop better communication skills (Suriyanisa et al., 2024).

The use of interactive media such as Padlet in learning is also supported by various theories. As stated by Ervina et al. Ervina et al. (2023), Padlet allows students to collaborate, discuss, and convey their ideas in a more dynamic way. It is in line with the theory that interactive media can create a more engaging learning environment and support active student engagement. Padlet provides space for students in order to interact more flexibly and deeply, which in turn enriches students' learning experiences. Thus, the findings of this study support existing theories about the effectiveness of PBL and interactive media in improving students' understanding of subject matter and social skills. Both of these elements contribute to more holistic and contextual learning, allowing students to better understand the relationship between theory and practice in daily life.

Although the results of this study provide valuable insights, there are several limitations, such as the limited sample size of students at SMA Negeri 1 Probolinggo, which may not represent the conditions of other schools with different contexts so that the results cannot be generalized. In addition, this study focuses more on the application of PBL and Padlet in geography learning without considering other factors which influence learning outcomes, such as student learning styles, teacher experience, and parental support. Therefore, further research is recommended to use larger and more diverse samples, and consider other variables that influence the effectiveness of PBL and interactive media, as well as explore the impact of technology use in learning on student learning outcomes in various subjects.

CONCLUSSION | خاتمة

Based on the research which had been conducted, the implementation of the Problem Based Learning (PBL) model supported by the Padlet learning media shows a significant increase in learning outcomes and student involvement in geography learning; especially, in the material on atmospheric dynamics. The increase in the average score from 56 in the pre-cycle stage to 79 in cycle I and 88 in cycle II shows that this strategy is able to improve students' understanding of the concept of the atmosphere and related phenomena. In addition, the percentage of classical completion increases from 11% in the pre-cycle to 74% in cycle I and reaches 86% in cycle II, showing the effectiveness of PBL with the support of interactive media in achieving learning objectives classically. The application of the PBL model helps students to think critically and analytically in solving real problems while Padlet provides a collaborative platform that motivates students to interact actively. The combination of these two elements creates a learning environment which is more interesting, interactive, and relevant to students' needs.

The PBL model supported by Padlet media has been proven to be able to create a more holistic and contextual learning experience, as well as encourage the development of students' critical thinking and problem-solving skills. This real-world problem-solving-based learning provides students with the opportunity to connect material with daily life situations. This changes geography from a subject that relies on memorization to a means to train critical and analytical thinking skills. In addition, learning that integrates interactive media, such as Padlet, increases student engagement and allows them to share ideas and collaborate with their peers. Thus, learning becomes more dynamic and it is able to develop a deeper understanding of the cause-and-effect relationships in atmospheric phenomena.

Based on these findings, some recommendations for further research are as follows. Further research is recommended to involve larger and more diverse samples and conduct research in various schools with different contexts, both in urban and rural areas, in order to ensure more representative results. In addition, an in-depth qualitative approach can be used to explore students' and teachers' experiences in using PBL and Padlet models, and understand their perceptions of these two approaches. Further research can also develop a more integrated digital platform with an automated evaluation system or structured discussion space, in order to support problem-based learning more comprehensively. Finally, the application of PBL and Padlet models which have proven effective in geography can be extended to other subjects that require analytical skills, such as social studies or science, in order to test their effectiveness in a broader context.

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