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The Effect of the Problem-Based Learning Model on Geography Learning Outcomes in Relation to Students' Naturalist Intelligence

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ABSTRACT

The purpose of this study was to determine the application of the problem-based learning model to students' naturalist intelligence, the effect of the problem-based learning model and naturalist intelligence on student learning outcomes, and the interaction between the problem-based learning model and naturalist intelligence on student learning outcomes in geography in grade XI of MA Ma'arif 9 Kotagajah . The method used in this study was an experiment with a quantitative approach. The sample in this study was grades XI IPS 1 and XI IPS2, totaling 71 students. Data collection techniques used observation, tests, documentation, and interviews. Data analysis used two-way ANOVA. The results of this study indicate that the application of the problem-based learning model can improve naturalist intelligence in grade XI IPS 1 as the experimental class. Overall, the observation results for the problem-based learning model showed a score of 86.36%, and for students' naturalist intelligence, a score of 86.25%, which falls into the very good category. There was a significant effect of the problem-based learning model on geography learning outcomes with a value of 0.026. There is a significant effect of naturalist intelligence on geography learning outcomes with a value of 0.00, and no interaction between the problem-based learning model and naturalist intelligence on learning outcomes with a significant value of 0.264.

INTRODUCTION

Education is one of the aspect important in formation character and abilities individuals who ultimately will influence progress nation . in " Law Number 20 of 2003" concerning system education national , article 3 objectives education national is " developing potential participant educate to become a man of faith and piety to God Almighty, have morals noble , healthy , knowledgeable , capable , creative , independent as well as become democratic citizens are also responsible answer ". Education is a further process of humanism known with term humanize human beings . Therefore that , we should Can honor right basic every human beings . Students in other words pupils however No A man machine that can arranged as he wishes , but they is the generation that needs We help and give concern in every reaction the changes going to maturity so that can form human who is self-sufficient , thinks critical as well as own attitude good morals .

Geography as part from IPS can develop results reviewed learning from intelligence naturalist . Intelligence naturalist is abilities that can classify with more both flora and fauna, like plants and animals , more sensitive and more care for the environment nature , love nature and can invited participate in related matters with environment . This is proven with Still many students who have not understand and know about material geography about nature . Students Not yet understand distinguish flora and fauna in each regions in Indonesia, students not enough care to environment around good at school both inside and outside environment schools and students Not yet understand How impact global warming for environment . Someone students who have intelligence high naturalism is very possible For get results Study good geography . Intelligence naturalist can applied in learning geography . Geography is defined as the science that studies or study earth and everything something that is on top of it , such as population , fauna, flora, climate , air , and everything the interaction .

Based on results pre research that has been conducted at MA MA'ARIF 9 Kotagajah , showing that in the implementation learning geography teachers still using inadequate learning models varies that is using a learning model conventional where teachers are more play a role active compared to participant educate so that the learning process become passive . This is result in lack of interaction during the learning process and participants educate tend feel bored and not pay attention to the teacher. Participants educate more often take notes and listen to the teacher deliver material so that the learning process not enough attract and enhance interest Study participant educated . Low activity participant educate in the learning process can influential to results Study students . Teachers play a role active as facilitator who helps make it easier student in learning and students can also develop understanding knowledge and skills so that student capable Study independent . Low results learning gained student influence the learning process teaching carried out by teachers. Therefore That required method or appropriate learning models to improve results Study students (Miswar et al ., 2013). Following is table results Study eye lesson geography student class XI IPS MA MA'ARIF 9 Kotagajah

Table 1. Geography Learning Outcomes of Class XI Social Studies Students at MA Ma'arif 9 Kotagajah

class	Score <70 (Not finished)		Score >70 (Completed)		Amount student
	Amount student	%	Amount student	%	
XI S 1	22	62.8 %	13	37.2%	35
X1 S2	25	69.4 %	11	30.5%	36
Amount	47	66.19%	24	33.80%	71

Based on table 1 results learning in the eyes lesson geography obtained results are not optimal. It is known mark learning geography classified as Still low , seen from the data above show from all over amount student class XI IPS who received value 70 or reach criteria minimum completion , as many as 24 students (33.80%) while the rest get mark below the KKM , namely 47 students (66.19%). From the statement the show that part big student own results learning that is still low .

On intelligence data naturalist researchers do interview with 15 grade XI students and geography teachers that is with Mrs. Wiwik on October 12 , 2024 resulting in that Lots students who have not understand and know about intelligence naturalistic and deep material concerning intelligence naturalist participant educate tend only get knowledge However No apply it , for example Still Lots participant students who throw away rubbish carelessly . Enthusiasm and interest participant educate in Study about natural Still not enough because the teacher only give material with method lecture , the teacher does not give problem real about change environment and participants educate No given description related distribution of flora and fauna in Indonesia and the world, activities not even studying Once done outside class Because limited study hours resulting in not enough effective For do outdoor learning class . Participants students of XI IPS 1 and XI IPS 2 have not yet understand about reason damage natural especially those that have an impact on the extinction of flora and fauna in Indonesia. Most of them student No care with environment around Good about animals and plants for example No nurse plants around school with water or give fertilizer but rather ruin it .

One of internal factors that can influence results Study student in learning geography is intelligence . In learning geography There is a number of influential intelligence important one of them is intelligence naturalist .

Intelligence naturalist is part from intelligence compound intelligence possessed by humans . This covering sensitivity to problems or phenomenon nature and ability differentiate creature life and creatures No life . Intelligence naturalistic is one of the from various intelligence *(multiple intelligences),* which is necessary developed and improved in each student Because competence the considered weak in Indonesia (Adisendjaja *et al.,* 2019). Intelligence naturalist related with understanding about nature that includes ability For identify and classify differences and similarities between characteristics species Good plants , animals and the environment capable life interact in a way effective with nature (Zen & Sihes , 2018). Somebody students who have intelligence high naturalism is very possible For get results Study good geography . Based on description problem that is one of them ways that can make participant educate active in the learning process is with implementing a variety of learning models (Riswati , 2018). Innovative and appropriate learning models implemented For finish problem about results Study reviewed from intelligence naturalist is *problem-based learning*.

Problem based learning (PBL) is appropriate For create environment good learning . PBL prepares participant educate think critical , analytical , and finding with use various type source (Sumarmi , 2012). One of the learning models that is capable of linking material learning with life real or contextual is learning based problem or known with term *problem based learning* . According to Sanjaya (2006) the learning model based problem can interpreted as activity learning that emphasizes the completion process problems faced in a way scientific . According to Duch et al ., (1998) the *problem based learning model* provides condition For increase skills think critical and analytical as well as solve problem complex in life real so that will cause culture think to yourself participant education , learning process *problem based learning* is demanding student For play a role active in activity learning that is not only teacher -centered with so can increase results Study participant educate on the material the lessons delivered . This in accordance with character learning Geography that studies or learn symptoms on the surface earth in a way overall along with all interaction . In a way theoretical *problem based learning* model is used because of this model in accordance with learning that centers on real world problems in intelligence naturalist . Participants educate can understand about issue issue environment like global warming , climate change ecosystems , and exploitation natural so that learning more affectively and empirical learning model *problem based learning* is used For push participant educate For solve related issues with intelligence naturalist . For increase ability student solve problem about nature teachers must can develop a learning model that can increase ability develop , discover , investigate , and reveal idea from students . So that teachers are able to increase ability solve problem student in field environment . One of the learning models that can help student train solve problem namely the learning model *problem-based learning* .

RESEARCH METHODOLOGY

Methods used in study This is experiment with approach quantitative research experiment can interpreted as method of comparing influence giving something treatment *(treatment)* on a object (group experiments) and see size influence treatment (Arikunto , 2010). There are two classes that is class experiments (*problem based learning model*) and classes control (learning model conventional).Design research used in the study This is experiment pseudo *(quasi -experimental*), which is in the form of *nonequivalent control group design* . Experiment pseudo is type study For get information obtained with experiment in a state of affairs that is not allows For control all variables external influences implementation experiment (Sugiyono , 2012) experiment pseudo aim For show connection cause and effect between variables dependent and independent . In the research This used One class experiment and one class control , class experiment given treatment with using the *Problem based learning* (X) model and class control given treatment learning use method conventional research design presented in the table below This

Table 2. Experiment Design

Class	***Pretest***	**Treatment**	***Posttest***
Control Class	O_1	X2	O_2
Experimental Class	O_3	X1	O_4

Source : Sugiyono (2012)

According to Sugiyono (2012), the population refers to the entire group of subjects or objects possessing specific characteristics to be studied. The population in this study consisted of students from classes XI IPS and XII IPS at MA Ma'arif 9 Kotagajah, totaling 140 students. The sample was determined using a purposive sampling technique, a non-random method in which the researcher selects samples based on specific criteria relevant to the study's objectives (Sugiyono, 2019).

Data collection techniques included observation, tests, documentation, and interviews. The study involved three variables: the independent variable (learning model), the dependent variable (learning outcomes), and the intervening variable (naturalist intelligence). Data analysis was carried out using descriptive statistical analysis to summarize and interpret data related to students' naturalist intelligence and geography learning outcomes.

Instrument testing included validity, reliability, difficulty level, and item discrimination tests. Data analysis prerequisites consisted of the normality test and homogeneity test. Data were considered normally distributed if $p > 0.05$ and homogeneous if $p > 0.05$. Hypothesis testing was conducted using Two-Way ANOVA at a significance level of $\alpha = 0.05$ to determine the effects and differences between variables.

RESULTS AND DISCUSSION

Study This done using two classes that is class XI IPS 1 as class experiments and XI IPS 2 as class control . Researchers as a teacher who teaches in class XI, I give learning model treatment *problem-based learning* in class experiments totaling 35 students and classes control given learning conventional class consisting of 36 students . From research in the classroom experiments and classes control obtained results calculation mark *pretest* and posttest in each class . Can be seen in the table following This

Table 3. Comparison of Pretest and Posttest Results in the Experimental and Control Classes

Description	Class experiment (XI IPS 1)		Class control (XI IPS 2)	
	Pretest	*posttest*	*pretest*	*posttest*
Minimum value	30	52	26	39
Maximum value	82	95	69	90
Range	52	43	43	51
Average	53.03	71.08	45.03	61.42

Source : *pretest* and posttest data *posttest* 2025

In the table on can seen that mark *pretest* class experiments and classes control own difference in value the highest and lowest . So that can concluded that condition student class experiment more superior than class control . After given treatment in class experiment whereas class control No given treatment there is difference results Study between class experiments and controls after given *posttest* namely in class experiment experience improvement with value of 71.08, while class control only experience improvement with value 61.42. So can withdrawn conclusion that application of learning models *problem based* can make intelligence naturalist students in the eye lesson geography more Good

Researchers also conducted observation For know application of *problem-based learning* model can increase intelligence naturalist . Based on sheet observation get results namely the learning model *problem* based *learning* scores obtained is 86.36% and intelligence naturalist student scores obtained is 86.25%. Both sheet observation about application of learning models *problem based learning* and intelligence naturalist student enter to in very good category .

a. Influential Problem Based Learning Model On Learning Outcomes Students in Geography Subject Student Class XI at MA MA'ARIF 9 Kotagajah

The results of the study indicate that the Problem-Based Learning (PBL) model has a significant influence on students' geography learning outcomes in class XI at MA Ma'arif 9 Kotagajah. Based on the results of the two-way ANOVA test, it was found that there is a statistically significant difference in the learning outcomes between students taught using the PBL model and those taught using the conventional learning method. The obtained significance value of 0.026, which is smaller than 0.05, indicates that H_0 is rejected and H_a is accepted. This means that the use of the PBL model effectively improves students' learning outcomes in geography. Geography learning outcomes represent the culmination of the learning process carried out collaboratively by teachers and students. These results are consistent with the findings of Hilda et al. (2021), who demonstrated that the application of the Problem-Based Learning model in studying subthemes such as "Humans and Objects in Their Environment" led to significantly better learning outcomes than conventional methods.

The improvement in students' performance is attributed to the unique advantages of the PBL model, which encourages students to be active, engage in critical thinking, and develop solutions to real-world problems. By applying PBL, students are not merely memorizing facts but are instead constructing knowledge through exploration and inquiry (Barrows & Tamblyn, 1980). This active engagement fosters a deeper understanding of the material, which is further reinforced when students interact with peers and the learning environment (Hmelo-Silver, 2004). As a result, PBL facilitates the development of higher-order thinking skills, problem-solving abilities, and motivation to learn.

In the context of geography, PBL provides opportunities for students to apply spatial thinking and analytical skills in real-life contexts, such as environmental issues, resource management, and spatial planning (Metoyer & Bednarz, 2017). Moreover, Sriwahyuni (2019) noted that the PBL model promotes an active and creative learning atmosphere in which students are encouraged to ask questions, discuss, and collaborate to solve problems. This model also helps students retain knowledge more effectively, strengthens their understanding of the subject matter, and enhances leadership and teamwork skills (Amir, 2010). Therefore, the consistent application of the Problem-Based Learning model in geography education can serve as an effective pedagogical approach to improve both cognitive achievement and essential life skills among students.

b. Naturalist Intelligence Affects Learning Outcomes Students in Geography Subject Student Class XI at MA MA'ARIF 9 Kotagajah

The findings of this study also demonstrate that naturalist intelligence has a significant influence on students' geography learning outcomes in class XI at MA Ma'arif 9 Kotagajah. The results of the statistical analysis show that students with higher naturalist intelligence tend to achieve better geography learning outcomes than those with lower levels of this intelligence. The significance value obtained was 0.00, which is smaller than 0.05; therefore, H_0 is rejected and H_a is accepted. This indicates that naturalist intelligence contributes positively and significantly to students' success in learning geography.

Naturalist intelligence, as one of Gardner's multiple intelligences, refers to an individual's ability to recognize, categorize, and interact with elements of the natural environment, such as plants, animals, and natural phenomena (Gardner, 1999). In the context of geography learning, this intelligence enables students to better understand relationships within ecosystems, environmental dynamics, and the interconnection between human activities and natural processes. Students with strong naturalist intelligence are often more observant, curious about nature, and able to connect real-world environmental issues with theoretical concepts learned in class. These skills are particularly useful in understanding topics such as the hydrological cycle, climate change, landforms, and the spatial distribution of flora and fauna (Armstrong, 2009).

Furthermore, Suhirman et al. (2019) argue that intelligence, including naturalist intelligence, is an important internal factor that influences students' learning outcomes. Students with high naturalist intelligence are usually more motivated and engaged in geography because they perceive a direct connection between what they study and the real environment around them. This aligns with Wijaya (2023), who emphasized that geography plays a vital role in fostering environmental awareness and sustainability education. Through geography, students not only acquire cognitive understanding but also develop ecological sensitivity and responsibility toward environmental preservation.

Therefore, the integration of activities that enhance naturalist intelligence—such as field observations, environmental projects, and case studies—can make geography learning more meaningful and effective. Such activities encourage experiential learning, allowing students to develop not only academic competence but also an awareness of their role in maintaining environmental balance. This approach ultimately contributes to the development of environmentally conscious citizens, which is one of the primary goals of geography education in the 21st century (Habe & Kasful, 2022).

c. Interaction Between Learning Models With Naturalist Intelligence Influencing Learning Outcomes Student .

The results of this study also indicate that there is **no significant interaction between the Problem-Based Learning (PBL) model and naturalist intelligence** in influencing students' geography learning outcomes. This finding is supported by the statistical results showing a significance value of **0.264**, which is greater than 0.05; therefore, H_0 is accepted and H_a is rejected. This means that while both the PBL model and naturalist intelligence independently affect learning outcomes, their combined interaction does not produce a statistically significant effect. In other words, the influence of the PBL model on geography achievement does not depend on the students' level of naturalist intelligence, and vice versa.

According to Astuti (2019), PBL provides students with meaningful learning experiences through direct engagement in solving real-world problems that require collaboration, communication, and decision-making based on appropriate learning resources. This approach emphasizes reasoning and inquiry, encouraging students to construct knowledge through active participation. In principle, PBL should align well with naturalist intelligence because it often involves authentic contexts related to environmental and ecological issues. Students with strong naturalist intelligence generally demonstrate higher interest and motivation in activities involving nature, the environment, and living organisms. Therefore, it might be expected that these students would benefit more from PBL than their peers.

However, the absence of a significant interaction effect in this study can be explained by several factors. One of the main reasons is that students were relatively unfamiliar with the PBL approach, as they had previously been taught using conventional, teacher-centered methods. As a result, they required more time to adapt to the self-directed and inquiry-based nature of PBL. Additionally, the successful implementation of PBL demands specific facilitation skills from teachers, adequate time for discussion, and access to contextual learning materials—all of which may not yet have been fully optimized in the classroom setting.

Another possible explanation is that naturalist intelligence, although relevant to geography learning, may not have manifested strongly enough during the short implementation period of the experiment. Learning models like PBL tend to produce more noticeable interactive effects when applied consistently over a longer time and when supported by field-based or experiential learning opportunities (Amir, 2016; Hilda et al., 2021). In this study, the scope of activities may have been limited, thereby reducing the potential synergy between the PBL model and naturalist intelligence.

Thus, while both variables individually enhance geography learning outcomes, their interaction may require a more prolonged and contextualized implementation to be effective. Future studies could explore longer interventions or combine PBL with outdoor or project-based environmental learning to further strengthen the link between pedagogical approaches and students' naturalist intelligence.

CONCLUSION

The implementation of the Problem-Based Learning (PBL) model was found to improve students' naturalist intelligence in the experimental class (Class XI). Overall, the results of classroom observations show that the application of the PBL model and the students' naturalist intelligence fall into the very good category. The study also revealed that there is a significant influence of the Problem-Based Learning model on students' geography learning outcomes. Learning outcomes achieved through the use of the PBL model were better and more effective compared to those obtained through conventional learning models. Furthermore, naturalist intelligence was found to have a positive effect on students' geography learning outcomes, indicating that

students with higher naturalist intelligence tend to perform better academically. However, there was no interaction between the Problem-Based Learning model and naturalist intelligence in influencing learning outcomes, meaning that both factors contribute independently to students' achievement in geography.

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