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Problem Based Blended Learning Model and Learning Motivation on Critical Thinking Ability

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Abstract

This research aims to investigate the relationship between the Problem Based Blended Learning Model and Learning Motivation on Critical Thinking Ability. This experimental research was carried out using a 2x2 factorial design. The subjects in this research were students consisting of four classes with 130 class students in the city of Bangkalan, Madura. The subjects who were the focus of the experiment were taken in classical random order. This research hypothesis was tested using multiple linear regression statistical tests. These results provide evidence that: (1) There is a difference in critical thinking learning outcomes for the Problem Based Blended Learning Model with the conventional method, with the class average score showing that students who receive learning treatment with the Problem Based Blended Learning Model are higher than those with the method. conventional, (2) There is a significant (significant) difference in the average score of students' critical thinking learning outcomes between those who have learning motivation. It was found that learning motivation in science learning for students who applied the Problem Based Blended Learning Model was higher than students who had low learning motivation. (3) there is an interaction between the Problem Based Blended Learning Model and student learning motivation on critical thinking learning outcomes.

Keywords: Talent, Talent Management, Intention to Leave, Turnover Intention

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INTRODUCTION

To be able to understand statistics courses, you need a learning model that can support understanding of the learning process. This can be seen during the learning process, where students are only passive and do not participate enough in the learning process. Students' skills in asking and answering questions need to be improved, because students are not yet able to ask critical questions and the answers given are still limited to understanding. This can be seen from students still having an average score below the minimum completion standard (SKM). This condition occurs due to several factors. One of the obstacles is that it is still teacher centered, which causes it to be poorly understood by students, and the learning process still uses conventional learning. Students have not been directly involved, so they cannot apply critical thinking. Therefore, there needs to be a clear effort to improve students' critical thinking skills in the learning process.

The importance of critical thinking skills by (Aini et al., 2023; Rahmawati et al., 2022; Widiyono et al., 2023), which states that critical thinking is a dynamic process that allows students to detect differences in information, collect data, analyze the data obtained, evaluate and conclude information/data obtained so as to be able to draw conclusions from the findings according to actual conditions. Critical thinking ability is an ability that every person has to analyze ideas or ideas in a more specific direction to pursue relevant knowledge, not just based on wishful thinking but is scientific thinking because it is accompanied by real evidence. (Diani et al., 2019; Restu et al., 2023; N. Sari et al., 2020). Apart from that, students can get the habit of always thinking the best, so that students are able to think critically to create reactive and reliable thinking to use in seeking knowledge that is appropriate to learning. (Al-Qonita et al., 2023; Lalang, 2021; Siswi & Wahyudi, 2021). Critical thinking skills are very important for students because every lesson carried out always involves complex problem solving including problem solving, formulation, calculating possibilities and making decisions in solving learning material. Based on these problems, a student-centered learning model is needed which aims at students' critical thinking abilities.

Based on the problems regarding the weakness of statistics learning lectures at STKIP PGRI Bangkalan, it is necessary to improve the quality of lectures so that they become "strong learning subjects" which are curricularly characterized by contextual learning experiences with the characteristics: learning becomes more meaningful, integrated, value-based, challenging, and activating.

Effort Optimization of statistics learning at STKIP PGRI Bangkalan can be done one of the ways through Problem Based Learning Model (Firdaus et al., 2021; Inayah et al., 2021; Leggett & Harrington, 2021). The Problem Based Learning model is a learning model that can be applied to passive students who must be given a learning model that can enable students to learn independently, so that this can trigger student activity and increase their ability to think critically about learning. However, the problem-based learning model still has shortcomings such as difficulties in evaluating learning outcomes and requiring quite a long time to prepare and implement learning (Chen et al., 2021; Gunawan et al., 2023; Sulistiyani et al., 2022). The second weakness is that lecturers experience problems in changing teaching styles and students may need a lot of time to solve problems (Zainal, 2022).

Based on the explanation above, it can be concluded that the weakness of the problem-based learning model is that it requires quite a long time to understand or translate and evaluate the learning

material provided. This can be overcome by using a combination of problem-based learning and blended learning models which can support learning anywhere and at any time according to student learning needs. Therefore, blended learning is an integration of face-to-face learning with online learning. Blended learning is described as a model for learning where lecturers utilize technology, usually in providing web-based instructions, daily assignments, or perhaps as the instructor's main instructions.

Literature review

Several studies have been conducted to identify factors that can influence students' critical thinking abilities in learning. One significant factor is the learning model applied in the learning process. Research by (Karmana et al., 2020; Rachmawati & Rosy, 2021; Ratmasari, 2021) shows that the problem-based learning model has a positive influence on students' critical thinking abilities. Students who use the problem-based learning model show higher critical thinking abilities compared to conventional learning. Apart from that, research by (Astuti et al., 2021; Ibnu, 2020; Rohmah et al., 2022) shows that the problem-based learning (PBL) learning model can improve students' critical thinking skills. The results of this research show an increase in student learning outcomes in fraction form material after using the PBL learning model.

Several learning models that can be used to improve critical thinking skills such as problem-based learning (PBL) (Astuti et al., 2021; Ibnu, 2020; Rohmah et al., 2022), and based learning (Habibah et al., 2022; Nurma'ardi & Kuswaty, 2023; TN Sari et al., 2023) has been proven effective. Apart from that, critical thinking skills are also an important factor in problem solving. However, of the several problem based learning models used to improve critical thinking skills, it is still rare to integrate these models with blended learning. Problem-based learning (PBL) is a learning approach that focuses on problem solving. In PBL, students are given a complex problem or situation to understand the problem, find the necessary information, formulate questions, and find solutions. Blended Learning, also known as mixed learning, is a learning system that combines two learning methods, namely direct learning and online learning (Idris et al., 2022; Sulistiyani et al., 2022; Susanti & Makiyah, 2023). In the online learning process, various platforms can be used effectively, whether in the form of applications, websites, social networks or Learning Management Systems (LMS) (Alfiah et al., 2022; Makiyah et al., 2023; Okyere et al., 2023)

Based on these problems, it can be concluded that statistics learning at STKIP PGRI Bangkalan is still lecturer-oriented so that students become passive and the results are still not optimal in solving learning problems. Researchers have the initiative to conduct research with the title "Problem Based Blended Learning Model to Improve Critical Thinking Ability in statistics courses at STKIP PGRI Bangkalan".

METHODOLOGY

Research Design

This type of research uses a quantitative approach with a quasi-experimental type of research, with a pre-test post test control group design. Because this type of quasi-experimental research is considered one of the most commonly used in educational research, in quasi-experimental research,

researchers collect data from pre-test post-test control group design results. (Sugiyono, 2017, 2019a, 2019b). Therefore, quasi-experimental research was adopted to test the Problem Based Blended Learning Model on Critical Thinking Ability in statistics courses.

Participants

The research subjects were STKIP PGRI Bangkalan students in the Primary School Teacher Education Study Program in statistics courses. The sample of this research was two classes totaling 65 students. The courses are being implemented this semester, with lecturers who teach the courses and study program managers. The sampling technique used is a saturated sample, namely a determination technique where all members of the population are used as samples.

Instruments

The data collection techniques used in this research include questions and questionnaires. According to (Sugiyono, 2017, 2019a, 2019b), questions or questionnaires are a data collection method where respondents are expected to answer a series of questions and return them to the researcher. In this research, respondents were asked to work on questions and fill out questionnaires containing questions about their thoughts, feelings, attitudes and behavior while participating in learning activities using the PBBL model. The purpose of using questions and questionnaires is to collect information about student responses to the learning model used in this research.

Procedure

The design used in this research is pretest posttest control group design (Sugiyono, 2017, 2019a, 2019b). In this design there are three groups selected randomly and it is assumed that the three groups have the same characteristics (homogeneous). Two groups were given treatment (experiment), and one group was used as the control group. The three groups were given a pretest to determine the students' initial abilities, then given special treatment for the experimental group, and finally given a posttest to determine their final abilities. The results of Critical Thinking Ability tests and observations are compared or tested for differences. If the tests and observations in the early and final stages in the experimental group show differences, then there is an influence from the treatment given.

The research steps carried out include: (1) conducting a pre-survey and applying for school permits, (2) making instruments, validating instruments and testing instruments, (3) coordinating with teachers regarding learning using the *Problem Based Blended Learning Model*, (4)) carry out a pre-test; (5) giving treatment to the experimental group using the *Problem Based Blended Learning Model* and the control group using conventional methods, (6) giving a posttest to each research group, and (7) data analysis.

Data analysis technique

The data analysis technique in this research uses descriptive statistics and inferential statistics. Descriptive analysis is used to present data that has been obtained from the pre-test and post-test results

on Critical Thinking Ability in the experimental group and control group in the form of (mean, standard deviation, minimum score and maximum score) which will be presented in table form so that the presentation of the data will be easy to understand.. Inferential analysis is used to test the hypotheses that have been created.

In hypothesis testing, multiple linear regression is used. Hypothesis testing begins with a univariate mean difference test using the independent t-test. This test was carried out to see the influence of the *Problem Based Blended Learning Model* on Critical Thinking Ability. Before carrying out inferential statistical tests, the data must meet the prerequisite tests for analysis, namely the Normality test and homogeneity test. Normality testing was carried out using the Kolmogrov-Sminorv method. The normality test is used to determine whether the data is normally distributed or not, while the homogeneity test is used to determine whether the data comes from a homogeneous population or not. Multivariate homogeneity test using Box's M test and univariately using Levene's Test. Data is said to be normally distributed and homogeneous if the significance value is > 0.05. Normality and homogeneity testing using SPSS 25.0. for windows

RESEARCH RESULT

In the section below we will discuss hypothesis testing regarding differences in Critical Thinking Ability which are reviewed based on the level of learning motivation, namely low and high levels of motivation. Then it will also be explained about student learning outcomes which are reviewed based on the model used, namely the Problem Based Blended Learning Model with conventional methods and finally, the interaction pattern between two factors will be tested, namely the joint influence between the learning model used and the level of student learning motivation. on Critical Thinking Ability learning outcomes.

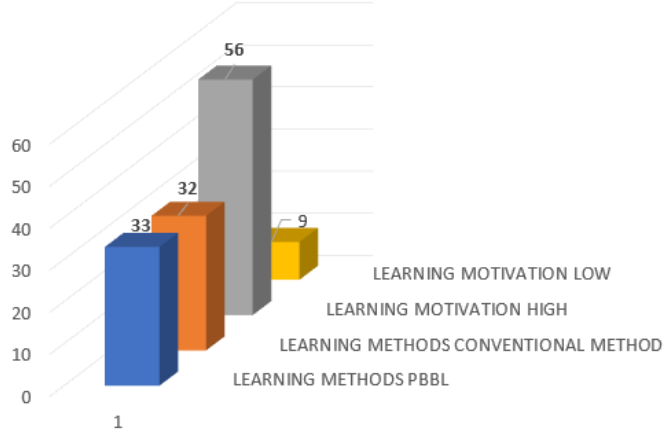
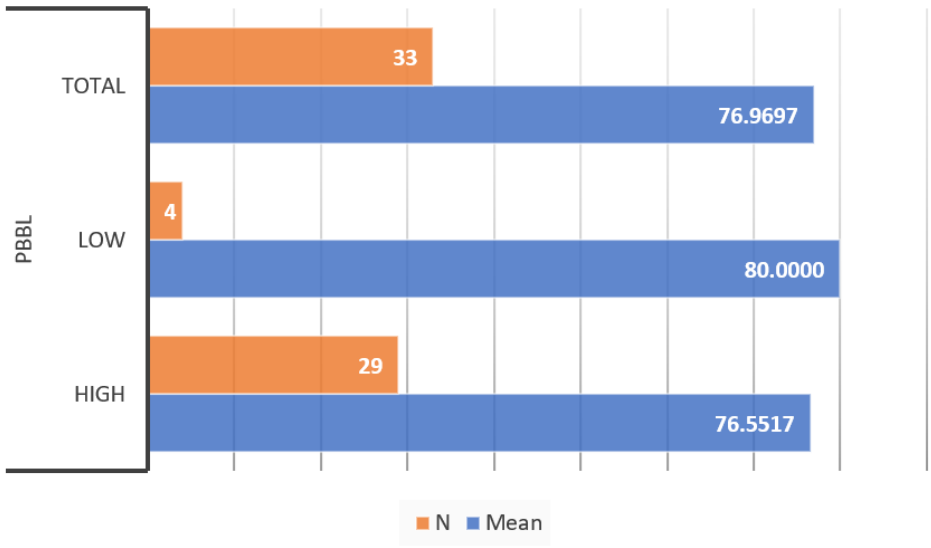
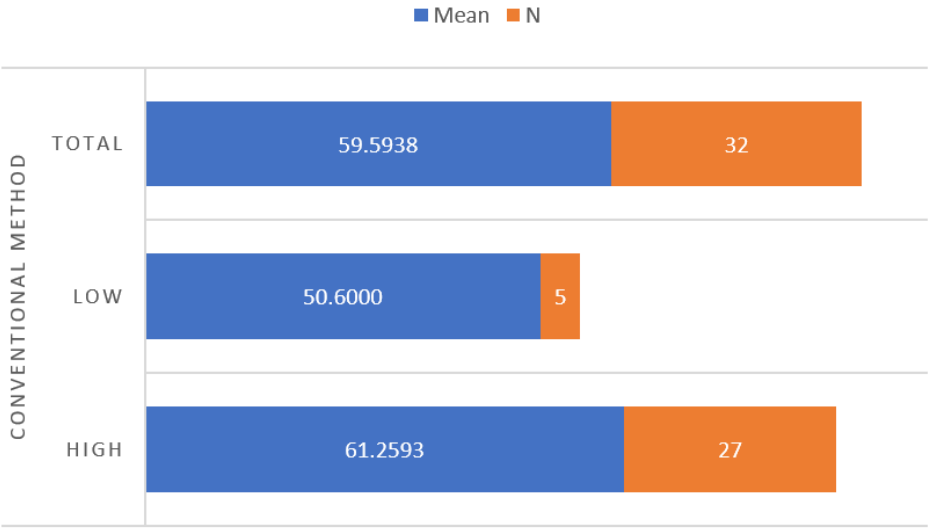


Figure 1. Data on Differences in Problem Based Blended Learning Models and Learning Motivation

Learning outcomes Critical Thinking Ability using Learning Motivation. Above, the results of the data test on students' learning motivation using low motivation levels and high motivation levels are displayed. For data on student learning outcomes, there were 9 students using a low motivation level, while there were 56 students with a high motivation level.





DISCUSSION

A. Use PBBL model And Conventional Methods for Critical Thinking Abilities

Based on the results of calculations and test results carried out in each class, it can be explained that students' critical thinking abilities, on beginning learning own ability the same, where the average Critical Thinking Ability is the same. After treatment using the PBBL model there was a significant difference in Critical Thinking Ability, there was an increase in Critical Thinking Ability. This illustrates that using the PBBL model provides students with initial knowledge to learn and improve their Critical Thinking Ability. Furthermore, students who still used conventional methods did not have a significant average difference in their Critical Thinking Ability, either before learning or after learning. This can be explained that little material can be absorbed in the Conventional Method, in contrast to the PBBL model, where almost all the material can be absorbed by students, because students are directly involved in the

problems given and the provision of various learning resources and communication treatments. And collaborate with Teacher more Lots time done, when students study, do assignments and interpret them, so that students master the material better. The average difference between classes using the PBBL model and the conventional method has a significant difference, this is indicated by the calculated t value being greater than t table (5.266 > 2.00) and the significance value of the difference between the two learning methods is below 0.05.

Apart from that, calculations using 2-way variance analysis show that the FA value (F calculated for the PBBL model and Conventional Method) results are greater than the F table, meaning that there is an influence of Critical Thinking Ability between the PBBL model and conventional methods applied to students. The results of this calculation show that the proposed hypothesis is acceptable, where there are differences in Critical Thinking Ability between those taught using the PBBL model and those taught using conventional methods.

The learning model that is always used and is familiar to teachers to inform their students about subject matter, Likewise, online learning is a learning model that has been around for a long time, but is less used by teachers. This learning model is now known as constructivist learning, a learning model that always uses function ability participant educate in a way maximum And very Hopefully, the learning will be very enjoyable and enjoyable short time. This has received recommendations from the world of education. The findings of the teaching and learning process using learning media always use the function of students' abilities to the maximum and are highly expected, learning is very fun and takes a very short time, children will understand the subject matter. To make students achieve high achievements and we will compare the learning process through achievements which are expected to achieve very satisfactory Critical Thinking Abilities.

From these results it is clear that the PBBL model has many advantages to be applied in the learning process, of course learning using the PBBL model will be better than conventional methods, this is because the PBBL model has wider access compared to conventional methods.

Several studies that have been carried out have obtained results which is significant for the PBBL model. Like research conducted by: Sipahutar, (2022) conclude that The expected result is that the Problem Based Learning learning model in blended learning provides an increase in students' mathematics scores. Azis et al., (2022) The results showed that at the pretest both populations had the same understanding of concepts and learning outcomes, changes occurred when the PBL and discovery learning models were applied. Through the average test, it was concluded that the PBL model of blended learning was better applied compared to discovery learning in the Business Mathematics course. Kusnadi et al., (2023), research results show that the PBL-based blended learning approach is effective in developing humanitarian literacy in Citizenship Education students. The article discusses the importance of human literacy as a 21st century skill and the development of a blended learning model using the ASSURE model to foster human literacy.

B. Use Learning Motivation on Critical Thinking Ability

Students in the learning process are very likely to have different levels of Learning Motivation, where students have high Learning Motivation and some have low Learning Motivation, the differences in Learning Motivation that these students have have their own influence on Critical Thinking Ability. This is also shown by the mean difference test, where the Critical Thinking Ability of both (students with

high Learning Motivation and students with low Learning Motivation) with different learning models, the PBBL model and conventional methods obtained different results between students who had high learning motivation And Low Learning Motivation Good That on PBBL model or conventional method showed by mark t count > t table, respectively for online learning methods and offline learning methods are 9,660 and 2,857.

In addition, by using multiple linear regression, the calculated FB (F) value is obtained for high levels of student learning motivation and low student learning motivation) the results showed that FB was greater than Ftable, thus giving the meaning that there was an influence on learning outcomes between students who had high learning motivation and students who had low learning motivation in statistics learning courses at STKIP PGRI Bangkalan.

This shows that the second hypothesis can be accepted, meaning There is a difference in Critical Thinking Ability in statistics learning at STKIP PGRI Bangkalan between those who have high learning motivation and those who have high learning motivation. low.

Students' Critical Thinking Ability is motivation Study And is very important in achieving Critical Thinking Ability, someone who works hard, wants to be competent, has hopes of success, and is worried about failure, tends to have the will to complete problems or tasks as quickly and as well as possible. Learners Which want a higher learning motivation, and want to work hard, will always try to complete their assignments, even though they face difficulties, students who have high initial learning motivation always try to complete their work as quickly as possible and as well as possible, in this case participant educate Which own Initial Learning Motivation tall tend has the desire to complete problems or assignments, even though he faces difficult mathematical assignments, he will always try to look for various sources that can help him complete the assignment well.

Likewise, students who already have learning motivation high level of interest in learning, good at receiving lessons, solving problems that include hypotheses and abstract proportions and able to make logical deductions or conclusions, more able to train oneself to complete tasks, even though they are different from what has been explained by lecturer in class. Students who are able to train themselves in explaining statistical learning tasks at STKIP PGRI Bangkalan, both to repeat what they have learned in class, and to prepare themselves to learn what that will be studied at the next meeting, tends to be better able to understand the overall statistical learning course, then he will be able to understand it, and if he can still find assignments that cannot understand him, and if he can still find assignments that cannot be completed, he can ask the teacher. Likewise, students who have learning motivation high self-training For complete tasks Which Not yet studied in in class, If he finds tasks that he cannot complete himself, then he will discuss them with his smarter peers, and if it is no longer possible to get answers, then he will ask the teacher inside. class on moment learn principal discussion Which load about assignments, students who want to work hard to complete tasks that are relevant to the goals that have been set, will be more active in looking for resources and utilizing them in completing problems or assignments, as well as students who already have learning motivation to make deductions or logical conclusions, will be more able to learn independently in completing ICT tasks, both those that have been studied and those that will be studied in class, so that he will be more understand the correct ways to complete assignments, students who have high learning motivation do not easily give up in solving difficult questions, as well as students who are better able to recognize simple forms hidden in complex forms never want to delay time and always be more thorough or careful in completing their work, thus students who have high

Learning Motivation tend to have Learning Motivation to perceive themselves as looking for a solution in completing the tasks they will face both in the classroom and at home.

Several studies that have been conducted have proven that learning motivation can contribute to improving critical thinking abilities. This can be proven from research conducted by: Mudana et al., (2023) The results of the research show that improving the science critical thinking skills of students who take part in Think Pair Share learning is facilitated by higher concept maps. Second, there is an interaction effect between the learning model used and students' learning motivation on increasing critical thinking skills in science. Third, the group of students who have high learning motivation, increase the science critical thinking skills of students who take part in learning using the Think Pair Share learning model, which is facilitated by higher concept maps. Fourth, for the group of students who have low learning motivation, the increase in science critical thinking skills of students who take part in learning using the Think Pair Share learning model facilitated by concept maps is lower than the critical thinking ability using the conventional model. Raharja et al., (2023), the results obtained in this research are as follows: 1) there are differences in critical thinking abilities and learning motivation together between students who take part in learning using the *Problem Based Learning Flipped Classroom* (PBLFC) model and students who take part in learning using the *Direct Flipped Classroom* (DFC) model with a significance value of 0.000. 2) there is a difference in critical thinking abilities between students who take part in learning using the PBLFC model and students who take part in learning using the DFC model with a significance value of 0.002. 3) There is a difference in learning motivation between students who take part in learning using the PBLFC model and students who take part in learning using the DFC model with a significance value of 0.000. The results of further analysis show that there is a positive influence between the dependent variable and the control variable, where the critical thinking abilities and learning motivation of students who take part in learning with the PBLFC model are better than students who take part in learning with the DFC model. Witri Lestari (2017), the main conclusion, namely; first, there is the influence of initial mathematics abilities on mathematics learning outcomes; secondly, there is the influence of learning motivation on mathematics learning outcomes; thirdly, there is an interaction effect of initial mathematics abilities and learning motivation on students' mathematics learning outcomes.

Istiyova et al., (2023), the results of the analysis show the influence of the guided inquiry learning model combined with brainstorming activities on students' critical thinking abilities and learning motivation. Effective contributions to aspects of critical thinking skills starting from the highest aspect to the lowest aspect are in the order of basic support, elementary clarification, advanced clarification, strategies and tactics, and inference. Aspects of learning motivation are obtained from the sequence of interesting activities, hopes for future goals, desire to succeed, encouragement of the need for learning, appreciation for learning, and conducive learning situations. The effectiveness of the learning model is 0.70 in the high category, which means that the guided inquiry learning model combined with brainstorming activities is effective in improving students' critical thinking skills. Julia & Sumaryoto, (2024) The results of the research show (1) There is a significant influence of Critical Thinking Ability and Learning Motivation together on Social Studies Learning Achievement (2) There is a significant influence of Critical Thinking Ability on Social Studies Learning Achievement (3) There is a significant influence of Learning Motivation on Learning Achievement.

Several studies have proven how important it is to pay attention to student learning motivation, so that you will get several benefits from knowing or paying attention to student learning motivation.

C. Interaction learning model and motivation to learn Critical Thinking Ability

Calculations using multiple linear regression are also used to determine the interaction between factor A (learning model) and factor B (Critical Thinking Ability).

Based on further calculations, the interaction between the two learning models and students who have motivation to learn high and motivation to learn low can be explained that by using multiple linear regression has significant interaction. This is indicated by the calculated F value > F table (15,881 > 3.89), and the significance level is less than 0.05 (5%) or even less than 0.01 (1%), so it can be concluded that There is an interaction between the learning model and learning motivation owned by students. This means that there is an interaction between the use of learning models and learning motivation on Critical Thinking Ability.

Based on the description above, it can be explained that students are motivated to learn high using the PBBL model have high Critical Thinking Ability compared to the Critical Thinking Ability of students who have motivation to learn low. Students with motivation to learn high using the PBBL model have high Critical Thinking Ability compared to the Critical Thinking Ability of students who have motivation to learn low. Next it is explained that by using the method learning Which appropriate And motivation to learn Which owned by Students will improve their critical thinking skills, in this case in statistics learning courses at STKIP PGRI Bangkalan.

Research that examines learning motivation and its influence on Critical Thinking Ability, has shown consistent results, for example there is a group of subjects who have motivation to learn high students obtain better Critical Thinking Abilities, compared to the group of subjects who have motivation to learn low, research conducted by (Julia & Sumaryoto, 2024) found that: (1) There is a significant influence of Critical Thinking Ability and Learning Motivation together on Social Studies Learning Achievement (2) There is a significant influence of Critical Thinking Ability on Social Studies Learning Achievement (3) There is a significant influence of Learning Motivation on Learning Achievement..

Research conducted by (Arjun Yoga Pratama, 2023) The research results show that: (1) there is a partial influence of self-efficacy on mathematical critical thinking with an influence contribution of 16%. (2) there is no partial influence of learning motivation on mathematical critical thinking with an influence contribution of 1.1%, (3) there is a joint significant influence of self-efficacy and learning motivation on mathematical critical thinking with an influence contribution of 20, 3% and the remaining 79.7% is influenced by other factors..

Research findings that examine learning models and their effects with Students' Critical Thinking Ability has shown results Which consistently, it was also found that the learning model will be very influential in a way significant with the Critical Thinking Ability he acquired students who have motivation to learn low, and must receive more guidance compared to students who have motivation to learn tall.

Conclusion

Based on the research, the following conclusions can be drawn. (1) There is a difference in the learning outcomes of critical thinking towards the metacognitive model with the lecture method, with the average class score showing that students who received learning treatment with the metacognitive model obtained higher science subject matter compared to the lecture method, (2) There is a significant difference (significant) on the average value of students' critical thinking learning outcomes among those

who have learning motivation. It was found that learning motivation in science learning for students who applied the metacognitive model was higher than students who had low learning motivation. (3) there is an interaction between the metacognitive model and student learning motivation on critical thinking learning outcomes in science and science subject matter.

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