

## THE INFLUENCE OF INDEPENDENCE AND MOTIVATION TO LEARN THROUGH PBL ON STUDENTS' PROBLEM-SOLVING ABILITIES

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### Abstract

The purpose of this research is to find out how the influence of student independence and learning motivation on the problem-solving abilities of Padang State University students in Space Geometry Courses through the Problem Based Learning (PBL) model. The research method used is a survey with correlation and regression analysis. The population in this study was UNP students, with a sample of 23 students with purposive sampling techniques. Data on student independence and learning motivation is obtained through questionnaires. In contrast, the data of problem-solving capabilities are obtained through tests. The results of the data analysis found that the influence of independence and learning motivation on problem-solving ability was shown by a correlation coefficient of 0.642 and a coefficient of determination  $R^2$  of 37.8%, and regression line equation  $Y = 42.271 + 0.334 X_1 + 0.404 X_2$ . The testing analysis obtained that the confident correlation and regression coefficient is significant. This research proves that there is an influence of independence and student learning motivation together on students' problem-solving abilities.

**Keywords:** Independence; motivation; PBL; problem solving.

### Abstrak

*Tujuan penelitian ini adalah untuk mengetahui bagaimana pengaruh kemandirian dan motivasi belajar mahasiswa terhadap kemampuan pemecahan masalah mahasiswa Universitas Negeri Padang pada Mata Kuliah Geometri Ruang melalui model Problem Based Learning (PBL). Metode penelitian yang digunakan adalah survey dengan analisis korelasi dan regresi. Populasi pada penelitian ini adalah mahasiswa UNP, dengan jumlah sampel 23 orang mahasiswa dengan teknik purposive sampling. Data kemandirian dan motivasi belajar mahasiswa diperoleh melalui angket. Sedangkan data kemampuan pemecahan masalah diperoleh melalui tes. Hasil analisa data diperoleh bahwa pengaruh kemandirian dan motivasi belajar terhadap kemampuan pemecahan masalah ditunjukkan oleh koefisien korelasi sebesar 0,642 dan koefisien determinasi  $R^2$  sebesar 37,8%, dan persamaan garis regresi  $Y = 42,271 + 0,334 X_1 + 0,404 X_2$ . Melalui analisa pengujian diperoleh bahwa koefisien korelasi dan koefisien regresi tersebut signifikan. Hal tersebut membuktikan bahwa terdapat pengaruh kemandirian dan motivasi belajar mahasiswa secara bersama-sama terhadap kemampuan pemecahan masalah mahasiswa.*

**Kata Kunci:** Kemandirian; motivasi; PBL; pemecahan masalah.



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## INTRODUCTION

Educational planning in creating safe and effective learning conditions can increase students' self-strength to have the level of intelligence, religious

values, self-control, well-being, and sophistication needed to advance society, nation, and state (Sanjaya, 2012). The above statement can affirm that education is expected to create all

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media for students to develop their abilities naturally. Plus, this effort can strive for a better learning environment, and student interests can develop optimally (Remijan & Township, 2017).

Learning has teachers who play a role in providing learning materials. The learning material in question is mathematics learning. Mathematics can be used as a research object because it can change according to structure, change, and space patterns (Pane & Dasopang, 2017). According to the formalist view, mathematics is an abstract examination using symbolic thinking logically and mathematical notation. According to KBBI, mathematics is interpreted as the science of numbers and has patterns in solving problems. This explanation suggests that mathematics is a pattern of thinking, as a language and knowledge structure that runs well.

In principle, mathematics is an insight needed in life. In every human life, everything is part of mathematics. In general, mathematics is assumed to be a difficult lesson by students or adults. The school environment is not interested in mathematics learning; sometimes, it is necessary to take time to provide mathematics learning materials.

The essence of mathematics learning is needed to provide students with the provision to have the ability to think logically. This mathematics learning is targeted at understanding mathematical concepts, including (1) describing the relationship of concepts and the application of concepts efficiently and precisely; (2) the use of reason in generalizing concrete evidence of mathematics; (3) problem solving includes the ability to understand problems, design math models, problem-solving in the form of

finding solutions; (4) interact ideas in the form of symbols, tables, diagrams in explaining problems; (5) have an attitude of appreciation for the use of mathematics in life, namely knowledge, interest in learning mathematics, persistence, and appearing confident in solving problems (Ambiyar, Aziz, & Delyana, 2020; Sadiq & Zamir, 2014; Suherman, 2015).

(Hamdu & Agustina, 2011; Manora et al., 2017) also stated that students are less motivated in learning mathematics because students feel mathematics is a very difficult and boring subject. Students are lazy to study at home and only study during tests. Students often chat about things that are not related to study together classmates, so that the learning objectives are not achieved.

Furthermore, when given different exercises with examples of questions, students are lazy to solve them. This shows that the interest and sharpness and tenacity of students in learning are not yet optimal. The results of interviews with lecturers in geometry courses, obtained information that students pay less attention to lecturers when explaining lessons, and students are less motivated to be active in expressing creative ideas such as responding to questions from lecturers.

The benefits of mathematics learning are needed in improving low-categorized affective abilities, especially the ability to realize student independence and motivation. Independence and motivation in learning are needed to guide themselves in a better direction to support success in learning. Independence and motivation can train students to apply this attitude to manage student actions (Asmar & Delyana, 2020; Lalian, 2018). This motivation can improve the

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attitude of discipline, responsibility, student learning ability in the learning process. Therefore, a breakthrough is needed, namely the learning model applied by teachers to stimulate students' independence and motivation in learning.

Mistakes that often occur in mathematics learning are the tendency of teachers who have not created different strategies in learning so that it seems monotone and boring. Students assume that mathematics is difficult learning and do not appear confident when given the responsibility to solve problems in front of the class. Mathematics learning should be well organized so that students are not saturated in the classroom and make them inactive. Their activities in mathematics learning, such as listening, recording, and doing what the teacher ordered, make students have no progress. But in learning, independence and motivation are needed to provide different learning strategies to students. Can cause comfortable and efficient learning conditions, namely with learning models.

One of the appropriate learning models used in this study is the problem-based learning (PBL) learning model that can be used to solve the problems found in learning.

## **RESEARCH METHODS**

This study uses the survey method to describe causal relationships and hypothesis testing so that it can find relative events, distribution, and intervariable sociological and psychological relationships. Research conducted at Padang State University in Padang on students in the Space Geometry Course. The population in this study was UNP students, with a sample of 23 students with purposive

sampling techniques. This technique is used to obtain the amount and characteristics of data based on certain considerations. The widespread use of samples is called saturated sampling techniques because there are fewer than 30 people. This sample reduces the error rate from the results of the data obtained. The data was sourced from observations, questionnaires, and interviews with 23 students of Padang State University for space geometry courses.

Research instruments are used as parameters for the data studied. These parameters are used as a tool in the form of observation guidelines that show the results of observations. Guidelines for questionnaires contain a list of Questions about the problems studied then questionnaires are given to respondents. This questionnaire determines the influence of independence and motivation to learn through PBL on student problem-solving skills. In this study, there are two variables: variable X is the PBL learning model, and variable Y is the independence and motivation of student learning sourced from the questionnaires answered by respondents.

Analysis techniques use validity tests, rehabilitation tests, normality tests, hypothesis tests with t-tests, and determination tests. The instrument validity test is carried out to measure questionnaires to be valid by using Pearson product moments. A reliability test needs to determine the low reliability of the instrument refers to the value of the correlation coefficient between the lists of a questionnaire. This reliability is marked with  $r$ , and the help of SPSS 22 is needed to calculate the correlation coefficient of reliability. In contrast, the instrument reliability

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test is carried out to measure the consistency of values on the influence of self-reliance and motivation through PBL on students' problem-solving abilities.

## RESULT AND DISCUSSION

To provide learning to students in accordance with their will so that learning targets are achieved well by using many learning models, one of which is the problem based learning (PBL) model. Barrow has the opinion that learning is done to understand the solution of a problem. These problems are solved in the learning process. PBL is one way of learning paradigm. Student-centered learning is not to the teacher as a teacher. Another opinion states that PBL is a curriculum process. A curriculum that includes well-designed money requires students' critical efforts to gain knowledge, problem solving, learning independence, having good participation (Huda, 2014). PBL is a learning model that involves students solving problems with the scientific method stage so that students can gain insights from these problems and have proficiency in problem-solving (Ngalimun; Fauzani, 2018). PBL can be defined as a learning activity that is oriented to the process of solving problems faced scientifically. This model has the characteristics of using problems as something that can develop the logic of thinking in solving problems and gain significant concept insights. This approach focuses on the learning process where teachers are responsible for supporting students in guiding self-improvement (Rusman, 2018).

Dutch mentioned that PBL is a money learning model that makes students learn in groups and find solutions to the feelings faced

concretely. Another opinion states that PBL is a learning model where students can use common sense in facing and designing insights to cultivate good inquiries and skills and have independence and motivation. Next, Ward mentioned that PBL is a learning model that requires the completion of the scientific method stage so that students can receive insights related to proficiency in solving problems (M & Lestari, 2018).

The PBL model is problem-oriented so that students can learn the concepts of the scientific method and problem-solving. Therefore, students are required to be the center of attention and get a learning experience related to the proficiency of applying the scientific method in problem-solving and improving logical thinking (Ngalimun; Fauzani, 2018).

Another opinion suggests the characteristics of PBL as follows (Ngalimun; Fauzani, 2018). (a) Learning is done from a problem; (b) Problems are given to students related to student conditions; (c) Organize problem-oriented learning; (d) Responsibility to the learner; and (e) Discuss by creating a small group.

According to learning in PBL opinion has characteristics in other versions (Arief, 2016), namely; (a) Determination of learning materials by students; (b) Providing learning materials that can foster students to share ideas and ideas in problem-solving; (c) Teacher enforcement as an intermediary medium is not the only source of information; (d) Teacher enforcement as an intermediary medium through the implementation of student-oriented PBL

Another opinion states that there are six procedures for implementing PBL (Jozua, Turmudi, Abdul, Suryadi,

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& Sabandar, 2016); (a) Awareness of the presence of problems; (b) Formulation of problems; (c) Hypnotist formulation; (d) Data collection; (e) Hypothesis testing; and (f) Determination of problem-solving.

The role of teachers in BPL(Rusman, 2018). The existence of teachers has an important role in PBL, such as; (a) Prepare students' thinking patterns; (b) Emphasis on cooperative learning; (c) Provide facilities for the group to discuss problem-solving; (d) Apply problem-oriented learning.

Independence is one of the potential students who can achieve learning targets. Another opinion states that independence is an individual target in development, which starts from childhood. Independence requires processes, support, encouragement, and opportunities from families, environments, and communities that can face the growth of quality children (Aines, 2017).

Zimbardo's opinion describes independence as related to behavior that has creative personality tendencies. Creativity is defined as trying to find solutions influenced by others, can do something that takes the initiative, and have high creativity. This creative trait can increase the mutu of life that indicates maturity in doing things (Aines, 2017)

Hersey and Blanchard's opinion states that the theory of independence is formulated as the ability of the person in charge and provides behavioral guidance in carrying out an activity. Independence relates to insights and skills gained from education, experience, and intrinsic motivation (Asworowati, 2020; Sulistyani & Roza, 2020).

Saunders stated that independence appears to be from a responsible

attitude, increased performance, life, and independence that pivots gradually and can be met with the needs and circumvention that has been obtained.

Independence has aspects:

1. Maturity of personality.
2. Solution discovery.
3. Interaction with others.
4. Increased agreements with others.
5. Do not follow others for no reason.

Indicators of student independence can determine based on student behavior. Based on experts' opinions, the foundation of independence relevant to the child's development period appears to be in the desire of students to learn. It has a responsibility in its actions and is not influenced by others in decision making, has a level of initiative in doing something, appears confident in doing something, and can work with other organizations.

Student independence in school is related to learning in school. Learning independence, according to (Badrulaini, 2018), is a motive to have the ability to motivate learning in a guided manner. Student learning independence can be defined as active learning, motivated to have proficiency.

Determination of learning target proficiency is an achievement in learning time, place of learning, the tempo of learning, how to learn, evaluation of learning carried out by students. Learning independence is the ability of students to be able to monitor cognitive control aspects, motivation, and behavior in learning (Zakarsyi, 2018). Then, Montalvo and Maria mentioned a number of characteristics of individuals having soft skills (Ngalimun & Fauzani, 2018).

The definition above can be described as that student learning

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independence is important. In addition to independence, there is a learning motivation that functions in achieving learning targets in school. Learning motivation is needed to improve the learning process because it will reach learning targets relevant to what is desired. Students who have high motivation will participate in active participation in learning.

- a) Each student has different desires and talents in the learning process. Therefore, teachers must be responsible for fostering student motivation in the learning process. Decca and Grawfor mentioned that students' learning motivation should be increased to keep students from continuing to have learning order by providing real expectations, providing incentives, and guiding students to behaviors relevant to learning targets. Hull suggests that motivation is the drive to meet the needs of human life. Another opinion states that motivation refers to a particular activity. Strength comes from within oneself in an activity displayed in a state in which the student makes himself move and perform a certain activity to achieve targets and goals.
- b) Notarized Bajwa motivation is based on the desire of a person to do something following the needs and goals achieved.
- c) Arend (Ike Abdurrahman & Natalliasari, 2019) added that the types of motivation are categorized into two, namely intrinsic motivation and extrinsic motivation. When a student learns about the solar system caused by the student's dream of becoming an astronaut, this desire is the tendency to feel happy without any coercion from others. This student will strive to learn and

achieve this desire. If the individual practice is done based on the desire, interest, and curiosity of this student is called intrinsic motivation.

- d) When an individual's behavior influences others to achieve the target, it is known as extrinsic motivation, such as the persistence of students learning to obtain rewards and fear of punishment. It is even considered absent by other friends.
- e) Another opinion adds that motivation can stimulate students in the learning process. Motivation has an important function in encouraging students to learn. This motivation impacts students' motivation in carrying out the learning process. Therefore, learning motivation that needs to be answered continuously.

The characteristics of students who have the motivation to learn in the learning process (Widiasworo, 2017) as below; (1) Teachers have the attraction so that students are not saturated in the following learning; (2) Student teacher's interest in learning materials; (3) High interest to divert attention to the material provided by the teacher; (4) Interest in discussions in small groups; (5) Recognition of self-identity to the people in the classroom; (6) Ability to control themselves in oral and behavioral form; (7) Interest in repeating learning materials'; and (8) Ability to be controlled by the environment.

The above explanation can emphasize that motivation is a driver of students learning so that targets can achieve properly. This motivation is embraced to create a learning atmosphere so that one can do learning by itself. Thus, the need for existence in students is motivated, especially in mathematics learning.

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Correlation coefficient regression test results are determined by the correlation criteria Table 1. Based on the level of the correlation coefficient in Table 1, the results of calculating the correlation coefficient of the influence of free variables on bound variables. The result of the calculations can be seen in Table 2.

Table 1. The correlation coefficient

Correlation Coefficient	Represented
0,00-0,199	No Correlation
0,20-0,399	Low Correlation
0,40-0,599	Medium Correlation
0,60-0,799	Strong Correlation
0,80-1,000	Very Strong Correlation

Table 2. Correlation coefficient of influence of variables X1 and X2 on variables Y

Model	R	R Square	Adjusted R Square	Std. Error of the estimate
1	.642 <sup>a</sup>	.378	.263	6,014

a. Predictors: (Constant), Motivation (X2), Independently(X1)

Based on Table 2, it can be seen that the double correlation coefficient of the influence of independent variables learning independence (X1) and learning motivation (X2) together on student problem-solving ability is 0.642. The calculation resulted that the correlation coefficient was significant; in other words that there was a significant influence of the free variable of learning motivation (X1) and learning independence (X2) together on student problem-solving ability (Y). While the determination coefficient was 37.8%, it showed that the size of the contribution of learning independence (X1) and learning motivation (X2) together to student problem-solving ability was 37.8%, the rest (62.2%) due to the influence of other factors.

Based on the validity and reliability tests above, several relevant studies support these findings. PBL could improve students' ability to solve mathematical problems. It positively impacts student learning independence because the PBL model can improve the average level and learning appears interesting and not boring. This PBL model can also allow students to stimulate students' ideas and ideas in

finding links to varied mathematical issues. It can overcome the barriers faced by students and provide new learning experiences during the learning process (Saputra, 2015). This result is explained below.

(Sariningsih & Purwasih, 2017) discussed the impact of problem-based learning on students' motivation and problem-solving skills. The results of this study appear to be different from the others because the use of PBL has not been able to improve the motivation of students to learn, especially in the study of Physics. This PBL is demonstrated by the learning results students have been able to improve their competence in problem-solving. Still, motivation is classified as low because it affects the remaining average value of half of the students who achieved it. Following the PBL model, students can do well through a group of friends (Argaw et al., 2017).

(Chiang & Lee, 2016; Fauzia, 2018) with the results of their research, stated that the PBL model with a scientific approach had a high impact on the ability of students to solve mathematical problems on the material compared with the motivation that was

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highly grouped so that the overall impact was positive. Barriers to connecting (Yuan, Lestari, & Andinny, 2019) mathematical skills with learning, such as understanding problems, the inability to understand mathematical matters, the inability to determine the measurement of concepts, the inability of students to connect data with concepts, and the inability to perform calculations, can be solved well (Aprianto, Muhammad, Rosmayado, & Prihatiningtyas, 2018).

PBL model can improve student activity and learning outcomes. This research is shown raw score daily repeat students obtained better results than before so that this PBL model can be properly used in the learning process (Asniardani, 2018). (Asmar & Delyana, 2020; Sulistyani & Roza, 2020) mentioned that independence and motivation are positively correlated because motivation is the use of thought consciousness in the form of actions carried out continuously. In addition, PBL is an appropriate model and suitable for developing student independence and motivation with the ability to solve mathematical problems. It can improve the logical thinking capacity, initiative, and motivation of students in learning. It can say that independence and motivation have the most important functions in improving the ability to solve math problems (Ike Abdurrahman & Natalliasari, 2019). Lestari, Andinny, and Mailizar show the influence of the interaction of situation-based learning models on the ability to solve mathematical problems. The same increased the use of influence learning models in team games tournaments. It makes positively impacts the ability to solve mathematical problems of students.

(Ida, Subagio, & Karnasih, 2021) stated that PBL measures improved student problem solving, such as problem-solving understanding, problem-solving strategy planning, implementing calculations, and the blackness of re-examination of the results obtained from students (Renny, Hutapea, & Saragih, 2019). Learning independence and motivation can improve students' ability to solve math problems. This evidence that the signification level is less than the significance value of 0.005, 0.003. The story of signification can state that it positively affects learning independence and motivation for mathematical problem-solving skills (Safitri, 2018). (Subekti, Fitrianto, & Jazuli, 2020) suggest that the ability to solve problems through PBL tends to be better when compared to conventional learning. The distribution of questionnaires given to the response increased the impact of the ability to solve problems and the independence of students' learning in computer application courses.

These results are supported by the results of testing double regression analysis has a significant impact so that learning independence and motivation can improve students' concept understanding ability through the TPSQ model (Afriyola, Rahmi, & Delyana, 2020).

(Habók & Nagy, 2016) explained that the Geogebra-assisted PBL model could increase students' learning motivation and positive influence, supported by research results showing that student learning outcomes rose from 93.97 to 96.16. It can say that the PBL and DI methods can recommend for teachers who apply them to the delivery of materials in the classroom, and the level of students understanding



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of the concept of curiosity towards mathematics learning further removes the stigma of mathematics being difficult (Ida et al., 2021).

## CONCLUSION AND SUGGESTION

The study results obtained that the influence of independence and motivation to learn through PBL on students' problem-solving skills can be grateful because the r-count of 0.39 is greater than the r-table.

There is a positive and very significant influence on learning independence (X1) and learning motivation (X2) together on the dependent variable of problem solving ability. This is evidenced by the results of hypothesis testing through multiple regression analysis. The results of this study have a positive effect on students' learning independence and motivation through the PBL learning model on students' problem-solving abilities in space geometry courses.

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