# Analysis Of The Use Of Project Based Learning On Students' Conceptual Understanding Ability In Statistics Material In Grade XI

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***Abstract***

This study aims to analyze the effect of the Project-Based Learning model on students' conceptual understanding of statistics in eleventh-grade students at SMA Negeri 2 Lubuk Pakam in the 2025/2026 academic year. The study used a descriptive qualitative approach, with 32 eleventh-grade students as subjects. Data were collected through a conceptual understanding test and a questionnaire assessing student responses to the Project-Based Learning model. The test instruments were tested for validity, reliability, difficulty level, and discriminatory power before use. The results showed that 12.5% of students had high conceptual understanding, 71.9% had moderate, and 15.6% had low. Project-based learning provided a more active learning experience, enhancing students' motivation, analytical skills, and collaboration in understanding statistics. However, students still faced challenges in interpreting statistical data and using statistical operations appropriately. Teachers play a crucial role in providing intensive guidance to address these challenges. Thus, the Project-Based Learning model effectively improves students' conceptual understanding, as well as their critical and creative thinking skills in statistics learning.

Keywords : Project Based Learning, Ability Conceptual Understanding, Statistics,
        Mathematics Learning

## INTRODUCTION

Education is a key factor in creating quality human resources. According to Law No. 20 of 2003, conscious and planned efforts are made to create a learning atmosphere and learning process so that students actively develop their potential to possess religious strength, self-control, personality, intelligence, noble character, and the skills needed by themselves, society, the nation, and the state. Education is designed from childhood to enhance human dignity, status, and abilities. Education also aims to improve individual humans in various ways, including improving their knowledge, character, attitudes, habits, and lifestyle.

High-quality and effective learning is necessary to achieve these desired educational goals. After reading the definition of education above, it is clear that education is crucial for improving human knowledge, morals, skills, and personality. As stated by Rusmana et al. (2024) , education aims to shape students' character and morals, as well as enhance their abilities to face future challenges.

Ideal learning is student-centered. Therefore, education is a conscious and planned effort to improve students' knowledge and attitudes. One subject that plays a crucial role in developing logical thinking, analytical thinking, and problem-solving skills is mathematics.

Learning mathematics is a crucial part of science. Mathematics plays a vital role in everyday life. One of its roles is as a means of conveying information. This information is conveyed using mathematical language and enhances the ability to think systematically and critically, as well as fostering creativity.

Mathematics learning contributes greatly to everyday life, so it is necessary to teach mathematics to students from an early age ( Nurhayati & Langlang Handayani, 2020) . Life has many problems that involve mathematics, starting from measurement, calculation, to problem solving. Mathematics is taught at all levels of education, from elementary school to college. In learning mathematics, students are not only required to memorize formulas, but also understand the underlying concepts so they can apply them in everyday life. So that students have the ability to understand concepts so they can apply concepts appropriately and efficiently in mathematics learning according to Mawaddah Siti and R. Maryanti (in Gultom et al, 2024) .

Mathematics as a subject must have objectives in the learning process. In the mathematics learning process, both teachers and students play a role in achieving these objectives. If the learning process is effective, these objectives will be achieved optimally. According to Hendriana (in Pangaribuan, 2022) , mathematics is a fundamental science subject that plays a crucial role in preparing quality human resources and contributing to the development of science and technology.

According to the Minister of National Education Regulation No. 22 of 2006, page 148, the objectives of mathematics learning are to understand mathematical concepts, explain the dependencies between concepts, and apply concepts flexibly, accurately, and precisely to solve problems. The development of mathematics education globally is in line with the development of mathematics education in Indonesia. In addition to the demands arising from technological and scientific advances, changing perspectives on mathematics learning have also influenced changes in the classroom learning process. However, it cannot be denied that mathematics education in Indonesia remains low compared to several other countries.

Mathematics education in schools is still unable to develop students' mathematical conceptual understanding skills. In their research, ( Istiqomah & Indarini, 2021) stated that the mathematical literacy assessment carried out by the PISA *(Programme for International Student Assessment) study* was grouped into 6 levels. The results of PISA 2022 showed that Indonesia was ranked 68th out of 81 countries with an average score of 379 in mathematics, 398 in science, and 371 in reading. ( Fauziyah et al, 2022) , Indonesia's score of 379 in 2018 placed Indonesia in seventh place from the bottom, below the average of 489. Furthermore, Indonesia scored 397 out of 500 in the TIMSS *(Trends in International for Student Assessment) survey* in 2018, which was conducted in 2018. This indicates the still low abilities of Indonesian students. Conceptual understanding is a learning achievement used in statistical mathematics learning.

Conceptual understanding is more important than mere memorization ( Silviana & Maryati, 2021) . According to Rosmawati & Sritresna (2021) , conceptual understanding is the ability of students to master material and the ability to absorb, master, understand, and apply it in mathematics learning. Conceptual understanding is the basis for understanding

principles and theories. Therefore, to understand principles and theories, students should first understand the concepts that make up these principles and theories. Therefore, it is important for students to understand concepts in mathematics ( Diana et al., 2020) .

Because we are constantly confronted with new things in our daily lives, we don't realize that everyone is constantly learning many concepts. Therefore, students need to develop conceptual understanding skills to apply them appropriately and efficiently in mathematics learning. Bintang (2021) states that cognitive levels and the ability to understand mathematical concepts are interrelated, as understanding a mathematical concept requires strong cognitive abilities.

The lack of students' mathematical concept understanding ability is caused by many students learning mathematics by memorizing formulas, without understanding the meaning and usefulness of the concepts being learned ( Rafianti et al., 2020) . The low understanding of student concepts is also caused by some students still thinking that mathematics is difficult, the symbols are abstract, and students are not much involved in constructing their knowledge, only receiving information conveyed by the teacher, and students are less active because most learning activities are centered on the teacher ( Darwani et al., 2023) .

Students tend to misunderstand the concepts of the problems they are given, so it's crucial to understand mathematical concepts and principles before solving them. Hafizh & Konsep (2023) stated that students often struggle with using formulas to solve problems, so efforts are needed to improve this understanding. Generally, mathematical difficulties are related to conceptual understanding. The learning process and learning outcomes are influenced by students' lack of conceptual understanding.

Based on the results of preliminary observations conducted by the author through interviews with Ms. Hanifah, S.Pd., a grade XI mathematics teacher at SMA Negeri 2 Lubuk Pakam, she stated that students' conceptual understanding of statistics material for grade XI is still low. In order for students to understand the material presented, teachers need to repeat the explanation. Some students are able to complete assignments with teacher guidance, but when the lesson is over and they are asked to explain again, they may forget or be unable to solve the problem without teacher guidance.

One effective way to improve students' conceptual understanding is through a learning model that can help students easily grasp the object (material) being discussed. In teaching a particular topic, a learning model that best suits the objectives to be achieved must be chosen. A learning model is a pattern used by teachers to convey teaching materials, while a method is a systematic way of working to facilitate activities to achieve the stated objectives. Therefore, a learning model is a model that will be used to solve this learning problem.

The learning model used by teachers is one reason why students don't understand statistics concepts well. Many teachers continue to use conventional approaches such as lectures and practice problems, but they don't provide students with effective learning experiences. One learning model that can improve students' conceptual understanding is *Project-Based Learning* . This model allows students to experience more contextual learning experiences where they work on projects related to the real world. Furthermore, *Project-Based Learning* encourages students to think critically, collaborate, and develop problem-solving skills. It allows students to participate more actively in the learning process by encouraging them to ask questions, investigate, explain, and interact with problems.

According to Firmansyah (2023) , *Project-Based Learning* essentially encourages students to develop problem-solving skills while requiring them to work on pre-planned projects. This model provides students with ample opportunities to choose research topics, plan their research, and complete their projects. Project-based learning is a learning model in which students are directly involved in project development.

Essentially, this learning model helps students acquire problem-solving skills by undertaking projects, enabling them to produce something. This model allows students to do many things, including conducting research, selecting topics, and completing projects. In an educational context, *Project-Based Learning* has been proven effective in developing various student skills and competencies ( Yanti & Novaliyosi, 2023) .

The application of *Project-Based Learning* in statistics instruction allows students to experience the learning process in a more in-depth and meaningful way. Students not only receive theory from the teacher but also apply it in projects oriented towards solving real-life problems. Through this approach, students are more engaged in the learning process, thereby improving their conceptual understanding of statistics material (Ayu & Anggraeni, 2020) .

Statistics is a branch of mathematics concerned with the collection, processing, analysis, and interpretation of data. Statistics is crucial for everyday life. Statistics plays a vital role in education, specifically for graduate competency standards related to statistics at the high school level. High school students must be able to understand and apply data presentation in the form of tables, diagrams, figures, graphs, and ogives, as well as measures of central tendency, location, and distribution, and their application in problem-solving.

Based on the description above, the researcher is interested in conducting research with the title Analysis of the Use of *Project Based Learning* on Students' Conceptual Understanding Ability in Statistics Material in Class XI of SMA Negeri 2 Lubuk Pakam in the 2025/2026 Academic Year.

**METHOD**

This research was conducted at SMA Negeri 2 Lubuk Pakam, Jalan Hamaparan Perak No. 40, Tj. Garbus Satu, Lubuk Pakam District, Deli Serdang Regency, North Sumatra, 20551.

This research was conducted in the 2025/2026 academic year. The data sources used in this study were teachers (educational staff) and eleventh-grade students. In this study, the subjects were eleventh-grade students of SMA Negeri 2 Lubuk Pakam. In this study, the data used was qualitative data. According to Sugiyono (in Hardianto et al. 2021) , qualitative data is data in the form of words, diagrams, and images. The qualitative data in this study were in the form of test results. With this descriptive qualitative approach, all facts, both verbally and in writing, originating from research sources that have been observed are then described or explained as they are according to the facts obtained from the sources, which will then be reviewed and presented as the results of the research. (Gusteti & Neviyarni, 2022) .

The type of research used in this study is descriptive research with a qualitative research design. The purpose of descriptive research is to systematically, accurately, and factually create statements and descriptions of the characteristics and relationships between the phenomena being studied.

According to Sugiyono (in Agustina & Ikhlas, 2022), qualitative research involves data in the form of words, sentences, and images, comprising a collection of non-numerical, descriptive data. Therefore, this descriptive qualitative research aims to analyze students' mathematical communication skills in solving problems in statistics .

Research instruments are tools used by researchers to collect data so that the research process becomes easier, more systematic, more accurate, and the results can be processed and analyzed objectively. (Rodriguez & Lieber, 2020) . According to Sugiyono (in Ernawati & Setiawaty, 2021), a research instrument is a tool used to measure observed natural or social phenomena. Researchers use research instruments as aids in data collection. The goal is to simplify and systematically analyze the research.

## RESULTS AND DISCUSSION

This research was conducted in the odd semester from July 23 to July 31, 2025 in class XI of SMA Negeri 2 Lubuk Pakam, Jalan Hamaparan Perak No. 40, Tj. Garbus Satu, Lubuk Pakam District. This research was conducted in 7 meetings with the experimental class. The experimental class consisted of 32 class XI students who were taught by researchers using Project Based Learning.

This study used a research instrument to measure conceptual understanding. Before use, the test instrument was pilot-tested for item validity, reliability, difficulty, and discriminatory power. The questionnaire was also pilot-tested to gauge student responses to the Project-Based Learning model.

**CAS Subject Data Analysis**
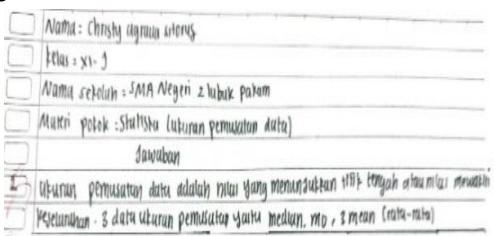


**Figure 1. Indicators Restating the Concept**

Based on Figure 4.1, CAS subjects successfully restated the concepts they had learned in the first stage. They were able to write down what was known and what was asked in the questions correctly and completely, and they also understood the questions well. This indicates that CAS subjects had met the first indicator of conceptual understanding.

**JLG Subject Analysis**
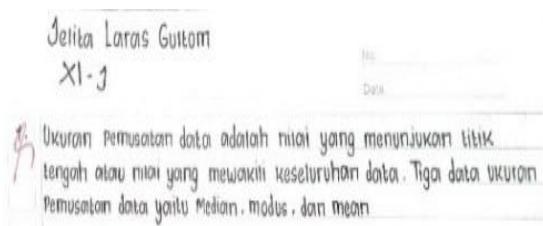


**Figure 2. Indicators Restating the Concept**

Based on Figure 4.6, JLG subjects with high conceptual understanding skills were able to restate concepts well. JLG subjects wrote questions correctly and completely without errors, and were able to understand concepts in detail and concisely.

**EFS Subject Analysis**
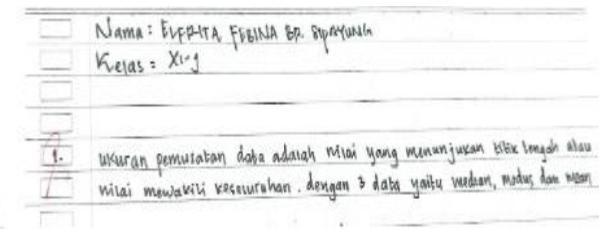
**Figure 3. Indicators Restating the Concept**

Based on Figure 4.11, EFS subjects with moderate conceptual understanding were able to restate concepts well and identify important information in the questions. EFS subjects were able to write down what was known and what was asked accurately and completely.

**RPS Subject Analysis**
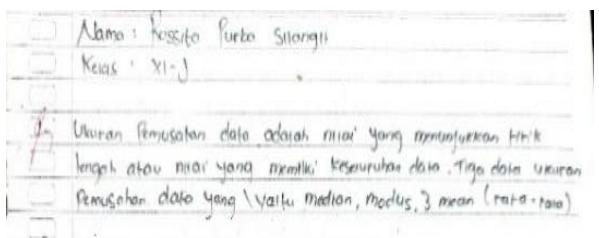


**Figure 4. Indicators Restating the Concept**

Based on the image, the RPS subjects with moderate conceptual understanding were able to restate the concept well. The RPS subjects were able to understand the concept and identify the questions in the problem completely.

**DISCUSSION**

In this study, an analysis was conducted to determine the level of students' conceptual understanding in solving problems on the central tendency measurement. The results showed that 12.5% of students had a high conceptual understanding ability, 71.9% were in the medium category, and 15.6% were in the low category (Purwanti et al., 2022) . This distribution indicates that most students were still at the medium level. Meanwhile, only a few reached a high level, and there were 32 students who still experienced difficulties in solving problems. To gain a deeper understanding of these results, an analysis was conducted based on the following five indicators of conceptual understanding ability:

The first indicator of conceptual understanding is restating previously learned concepts. Research results show that students in the high and medium categories can understand a concept well, are able to identify information in the problem, and can write down what is known and asked in the problem. Meanwhile, students in the low category often have difficulty understanding the context of the problem and determining the initial steps for solving (Pramesti et al., 2022) . Based on the results of the questionnaire, the obstacles that low category students face in understanding problems include:

1. Students feel confused and have difficulty writing down what is known in the question.
2. Students can only write down one thing that is known from the question being asked, while other information that is known in the question is not written down.
3. Students have difficulty identifying all the information in the questions.

*The Project-Based Learning* model requires students to think independently to understand problems, so those unfamiliar with this method tend to struggle. Therefore,

additional strategies are needed, such as practicing reading questions in depth and getting students used to identifying important information in a problem.

In the second indicator is grouping objects based on certain properties, namely 70% of high category students can determine the right method and formula and plan steps systematically. Medium category students can group objects, but are still unsure or choose the wrong strategy. Low category students often have difficulty grouping objects based on certain properties. Based on the results of the student questionnaire, their obstacles in grouping objects based on certain properties in understanding the concept are: Students do not understand the problem so they do not have the capital to group objects based on certain properties. Students do not know what mathematical formulas need to be used in solving the problem (Lestari et al., 2018) .

*Project-Based Learning* model , students should actively discuss and collaboratively develop problem-solving strategies. However, if students lack analytical thinking skills, they tend to struggle at this stage. Therefore, teacher guidance in guiding students' thinking strategies and providing varied solution examples can help improve their ability to group objects based on specific properties to enhance conceptual understanding.

In the third indicator is making examples of a concept and not using formulas, namely 75.9% of the research results show that students in the high category show good abilities, the medium category still often make mistakes even though the steps are quite correct, while the low category has difficulty understanding the concept and continuing to make examples because they do not understand the relationship between strategy and concept. Based on the results of the student questionnaire, their obstacles in making examples of a concept and not using formulas in understanding the concept are:

1. Students make mistakes in presenting data in frequency distribution tables.
2. Students make mistakes in determining the number of frequencies in each value interval.
3. Students experience difficulties in the process of creating examples and tend to experience difficulties at this stage.

*Project-Based Learning* model allows students to explore various problem-solving strategies, but if they lack adequate foundational skills, they are likely to encounter obstacles in implementing them. Therefore, a practice-based approach and teacher guidance in building procedural and conceptual understanding are crucial.

In the fourth indicator, namely using statistical operations to solve problems, 65.6% of the research results showed that students in the high category were able to use statistical operations correctly and systematically. Students in the medium category often made mistakes even though the steps were quite correct, while the low category had difficulty understanding statistical concepts and linking operations to conceptual understanding, making it difficult to continue solving problems. Based on the results of the student questionnaire, the obstacles they experienced in using statistical operations to solve problems were:

1. Students make mistakes in calculating the average, median, and mode values.
2. Students make mistakes in determining the frequency or distribution of data used in statistical operations.
3. Students experience difficulties in applying statistical formulas to the questions given and tend to experience confusion at this stage.

*The Project-Based Learning* model , combined with intensive teacher practice and guidance, will optimize students' understanding of statistical operations and reduce potential barriers arising from a lack of basic skills. This approach not only improves students' ability to solve statistical problems but also fosters their ability to apply these concepts in broader and more relevant contexts (Fahlevi, 2022) .

This fifth indicator refers to students' ability to re-check the accuracy of their answers by applying concepts correctly and precisely (69.1%). Students in the high category checked their results thoroughly, corrected errors, and drew accurate conclusions. Students in the medium category were sometimes less thorough in checking, while those in the low category rarely re-evaluated and readily accepted the final answer without checking. Based on the questionnaire results, there were several obstacles experienced by students in using concepts effectively at this stage, including (Anjarini, 2022) :
1. Some students forget to double-check their answers, so the evaluation process for the results obtained does not run optimally.
2. Some students feel that the answers they have obtained are automatically correct and do not need to be re-checked, so they do not use concepts critically to ensure the correctness of the solution.
3. Other students feel lazy and lack confidence in their answers, so they are reluctant or unenthusiastic about rechecking, even though this examination really relies on correct understanding of the concept.

Thus, it is important to cultivate students' awareness and skills in using concepts to comprehensively solve problems, including evaluating and reviewing their final results (Sari, 2018) . This will help students overcome these obstacles and increase their accuracy and confidence in answering questions.

*Project-Based Learning* model requires students not only to mechanically apply knowledge but also to evaluate and reflect on the solutions obtained. Because some students are not yet accustomed to self-evaluation, teachers need to actively encourage them to review their work using the correct concepts. This way, students are able to recognize errors, strengthen conceptual understanding, and critically revise answers. Teachers provide clear examples of reflection on the application of concepts in checking and refining solutions, so that students are accustomed to linking theory and practice in an integrated manner. This stage is important to ensure that the use of concepts in solving problems is not merely procedural, but involves in-depth critical and evaluative thinking processes (Chang & Hwang, 2018) .

Based on the analysis of the five indicators of conceptual understanding, it can be seen that the indicator that is most mastered or the indicator that is most often implemented by students is the first indicator, namely restating the concept, while in the fourth indicator, namely using statistical operations to solve problems, only a few students carry out this indicator or step, most students forget or lack confidence because they do not understand the relationship between statistical operations and the required conceptual understanding.

## CONCLUSION

Based on the data obtained from the analysis of the research instruments, the following conclusions are drawn regarding students' conceptual understanding of statistics. Four out of 32 students in the high category (12.5%) were able to understand the concept well. They were able to identify information in the problem, write down what was known and what

was asked, and systematically select the appropriate method and formula. These students were also able to create appropriate examples of the concept and use statistical operations to solve the problem. In addition to calculating the results, they double-checked to ensure the answer was correct, and analyzed and corrected errors well before concluding the answer. Twenty-three out of 32 students in the moderate category (71.9%) were also able to understand the concept well, identify information in the problem, and write down what was known and what was asked. They were generally able to group objects based on certain properties, but were still hesitant or often chose the wrong strategy. These students often made mistakes when creating examples and applying statistical operations, even though the steps taken were quite correct. They sometimes used the concept well, but were less thorough in checking the results, so the evaluation was not fully in-depth. Six out of 32 students, 15.6%, were in the low category and were unable to understand the context of the problem, making it difficult to determine the appropriate initial steps. They also struggled to group objects based on specific properties and grasp concepts, often failing to provide appropriate examples. Furthermore, they struggled to understand statistical concepts and apply statistical operations to solve problems. These students tended to be less thorough in double-checking their answers, easily accepting the results without making proper evaluations or corrections.

Based on the percentage results of the concept understanding ability test of students that have been done by class XI students of SMA Negeri 2 Lubuk Pakam, it can be concluded that the concept understanding ability of class XI students of SMA Negeri 2 Lubuk Pakam in completing 5 questions on statistical material is classified as a moderate concept understanding ability category with 23 out of 32 students with a value interval in the moderate category with a percentage of 71.9%.

**Suggestion**

Based on the conclusions above, the following suggestions are put forward:

1. Students are expected to be more active in the learning process and engage in discussions with peers to explore various strategies and steps for understanding concepts. Students should also practice working on story-based math problems more often to improve their conceptual understanding.

2. Mathematics teachers at SMA Negeri 2 Lubuk Pakam are expected to implement an effective Project Based Learning model to improve students' conceptual understanding. Teachers should provide ongoing guidance and support to motivate and engage students in the learning process, and develop strategies and steps to deeply understand mathematical concepts. By implementing Project Based Learning, students are expected to not only master the material theoretically but also apply the concepts in real-world contexts, resulting in significant improvements in conceptual understanding.

3. Schools are expected to provide support by providing adequate teaching and learning facilities, such as project-based teaching materials and a conducive learning environment. This way, schools can implement an effective Project-Based Learning model to improve students' comprehensive conceptual understanding. School support is crucial for optimal learning, enabling students to develop critical and creative thinking skills, and to deeply understand and apply concepts in various contexts.

**REFERENCES**

Agustina, R., & Ikhlas, A. (2022). Analisis Kesulitan Mahasiswa Menulis Karya Ilmiah Di Stkip Muhammadiyah Sungai Penuh. *Pendekar: Jurnal Pendidikan Berkarakter*, *5*(4), 6. https://doi.org/10.31764/pendekar.v5i4.11565

Anjarini, D. (2022). *Pengaruh model Project Based Learning (PJBL) berbasis outdoor study terhadap kemampuan berpikir kreatif dan kemampuan menyusun karya ilomiah geografi SMA*. Universitas Negeri Malang. Opgehaal van http://repository.um.ac.id/id/eprint/62404

Aulia, S. S., Hermansah, H., & Gusmania, Y. (2024). Efektivitas model pembelajaran contextual teaching and learning terhadap kemampuan literasi numerasi siswa. *Pythagoras: Jurnal Program Studi Pendidikan Matematika*, *13*(1), 67–76. https://doi.org/10.33373/pyth.v13i1.6184

Ayu, D., & Anggraeni, A. (2020). THE IMPLEMENTATION OF DUOLINGO TO TEACH DESCRIPTIVE TEXT IN SCIENTIFIC APPROACH. *PROJECT (Professional Journal of English Education)*, *3*(6). https://doi.org/10.22460/project.v3i6.p711-716

Bintang, R. . S. & R. (2021). Kemampuan Pemahaman Matematis Bangun Datar Segiempat Siswa SMP Berdasarkan Level Kognitif Di Masa Pandemi Covid-19. *Jes-Mat*, *7*(1), 59–75.

Chang, S.-C., & Hwang, G.-J. (2018). Impacts of an augmented reality-based flipped learning guiding approach on students' scientific project performance and perceptions. *Computers & Education*, *125*, 226–239. https://doi.org/10.1016/j.compedu.2018.06.007

Darwani, Hafriani, & Angkat, Y. (2023). Kemampuan Pemahaman Konsep Matematis Siswa Melalui Model Pembelajaran Flipped Classroom Di SMP/MTS. *Educator Development Journal*, *1*(1), 51–59.

Diana, P., Marethi, I., & Pamungkas, A. S. (2020). Kemampuan Pemahaman Konsep Matematis Siswa: Ditinjau dari Kategori Kecemasan Matematik. *SJME (Supremum Journal of Mathematics Education)*, *4*(1), 24. https://doi.org/10.35706/sjme.v4i1.2033

Fahlevi, M. R. (2022). Kajian Project Based Blended Learning Sebagai Model Pembelajaran Pasca Pandemi dan Bentuk Implementasi Kurikulum Merdeka. *Sustainable Jurnal Kajian Mutu Pendidikan*, *5*(2), 230–249. https://doi.org/10.32923/kjmp.v5i2.2714

Fauziyah, R. S., Anriani, N., & Rafianti, I. (2022). Kemampuan Pemahaman Konsep Matematis Siswa Smp Menggunakan E-Modul Berbantu Kodular Pada Smartphone. *Wilangan: Jurnal Inovasi dan Riset Pendidikan Matematika*, *3*(1), 71. https://doi.org/10.56704/jirpm.v3i1.13180

Firmansyah, D. (2023). Penerapan Metode Pembelajaran Berbasis Proyek Untuk Meningkatkan Motivasi Belajar Merangkai Komponen. *Jurnal Pendidikan*, *1*(3), 241–245.

Gusteti, M. U., & Neviyarni, N. (2022). PEMBELAJARAN BERDIFERENSIASI PADA PEMBELAJARAN MATEMATIKA DI KURIKULUM MERDEKA. *Jurnal Lebesgue : Jurnal Ilmiah Pendidikan Matematika, Matematika dan Statistika*, *3*(3), 636–646. https://doi.org/10.46306/lb.v3i3.180

Hafizh, M. A. Al, & Konsep, P. (2023). *Analysis of the Difficulty of Understanding Students ' Mathematical Concepts in Class X Statistics Material*.

Hardianto, M., Rachmat, A. Z., & Jasma, S. (2021). Manajemen Pemberdayaan Bidang Ekonomi di Masjid Baitul Atieq. *Journal Of Lifelong Learning*, 4(2), 126–132. https://doi.org/10.33369/joll.4.2.126-132

Istiqomah, J. Y. N., & Indarini, E. (2021). Meta Analisis Efektivitas Model Problem Based Learning dan Problem Posing Terhadap Kemampuan Berpikir Kritis Siswa Sekolah Dasar Pada Pembelajaran Matematika. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 5(1), 670–681. https://doi.org/10.31004/cendekia.v5i1.553

Lestari, T. P., Sarwi, S., & Sumarti, S. S. (2018). STEM-based Project Based Learning model to increase science process and creative thinking skills of 5th grade. *Journal of primary education*, 7(1), 18–24. https://doi.org/https://doi.org/10.15294/jpe.v7i1.21382

Nurhayati, H., & , Langlang Handayani, N. W. (2020). Jurnal basicedu. Jurnal Basicedu,. *Jurnal Basicedu*, 5(5), 3(2), 524–532.

Pangaribuan, L. R. (2022). Implementasi Pembelajaran Problem Posing Dalam Upaya Meningkatkan Kemampuan Pemecahan Masalah Matematik Dan Percaya Diri Siswa. *Sepren*, 3(2), 136–145. https://doi.org/10.36655/sepren.v3i2.648

Pramesti, D., Probosari, R. M., & Indriyanti, N. Y. (2022). Effectiveness of Project Based Learning Low Carbon STEM and Discovery Learning to Improve Creative Thinking Skills. *Journal of Innovation in Educational and Cultural Research*, 3(3), 444–456. https://doi.org/10.46843/jiecr.v3i3.156

Purwanti, P., Safitri, A., Pusporini, H., Kusumaningrum, S. R., & Dewi, R. S. I. (2022). Application of Project Based Learning Model for Class V Students Theme 5 Sub Theme 1 Ecosystem Materia. *Jurnal Ilmiah Mandala Education*, 8(4). https://doi.org/10.58258/jime.v8i4.4090

Rafianti, I., Iskandar, K., & Haniyah, L. (2020). Pembelajaran Search, Solve, Create and Share (SSCS) untuk Meningkatkan Pemahaman Konsep dan Disposisi Matematis Siswa. *Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang*, 4(1), 97. https://doi.org/10.31331/medivesveteran.v4i1.980

Rodriguez, S., & Lieber, H. (2020). Relationship Between Entrepreneurship Education, Entrepreneurial Mindset, and Career Readiness in Secondary Students. *Journal of Experiential Education*, 43(3), 277–298. https://doi.org/10.1177/1053825920919462

Rosmawati, R. R., & Sritresna, T. (2021). Kemampuan Pemahaman Konsep Matematis ditinjau dari Self-Confidence Siswa pada Materi Aljabar dengan Menggunakan Pembelajaran Daring. *Plusminus: Jurnal Pendidikan Matematika*, 1(2), 275–290. https://doi.org/10.31980/plusminus.v1i2.901

Rusmana, I. M., Wiratomo, Y., Nurfitriyanti, M., Karim, A., & Purnama, M. (2024). *Jurnal Pengabdian Masyarakat Biologi dan Sains Pelatihan Leadership Generasi Milenial dan Generasi Z di SMK Ar- Rasyadiyyah Kota Serang*. 3(2), 74–83.

Sari, I. K. (2018). The effect of problem-based learning and project-based learning on the achievement motivation. *Jurnal Prima Edukasia*, 6(2), 129–135.

Silviana, S., & Maryati, I. (2021). Kemampuan Representasi Matematis Siswa Melalui Model Problem Based Learning dan Probing Prompting Learning. *Plusminus: Jurnal Pendidikan*

*Matematika*, *1*(2), 303–314. https://doi.org/10.31980/plusminus.v1i2.903

Yanti, R. A., & Novaliyosi, N. (2023). Systematic Literature Review: Model Pembelajaran Project Based Learning (PjBL) terhadap Skill yang dikembangkan dalam Tingkatan Satuan Pendidikan. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *7*(3), 2191–2207. https://doi.org/10.31004/cendekia.v7i3.2463