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# The Impact of Initial Ability and Learner Interest on Learning Outcomes in Project Based Learning (PjBL)

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**Abstract**
This study aims to explore the impact of learners' initial ability and interest on learning outcomes in project-based learning (PBL). With the Systematic Literature Review (SLR) approach, it is a systematic research approach to identify, evaluate, and analyze literature or research relevant to a particular topic in an objective and structured manner. This study analyzed 35 journals that discussed the effect of initial ability and interest on student learning outcomes in project-based learning. The results show that higher initial ability makes it easier for students to absorb the material and develop practical skills such as problem solving. On the other hand, high interest encourages students' active engagement and motivation in the project, which contributes to improved learning outcomes. This study also identified that a mismatch between students' initial abilities and the PjBL approach can reduce the effectiveness of learning. These findings provide important insights for educators to design more effective learning that adapts to students' needs, and support more comprehensive curriculum planning. Project-based learning is expected to enhance 21st century skills such as creativity, collaboration and problem solving, which are relevant to prepare students for real-world challenges.

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## INTRODUCTION

Education is a fundamental aspect in the development of individuals and society. Education does not only focus on the transfer of knowledge, but also on character building, life skills, and adaptability to changing times (Fahrunnisa & Yusri, 2024). Along with the rapid development of technology and information, the demand for the quality of education is getting higher. Educators are faced with the challenge of creating learning methods that are not only effective in transferring

knowledge, but are also able to develop 21st century skills such as creativity, collaboration, and problem solving (Isman et al., 2022). One approach that has emerged in response to this challenge is Project Based Learning (PjBL). Project Based Learning (PjBL) is a learning method that emphasizes the active involvement of learners in completing real projects, where they are required to find solutions to problems that are relevant to everyday life(Kamariah et al., 2023). In this learning, learners do not only rely on memorization and theory, but are also trained to think critically, collaborate with others, and develop practical skills. According to (Istiqomah et al., 2022) Project Based Learning (PjBL) is considered capable of providing a deeper and more comprehensive learning experience, because it can connect the knowledge learned with the real-world context. With this approach, it is expected that students can have a better understanding of the material as well as the ability to apply it in more complex and varied situations (Purba & Munzirwan, 2022).

However, the effectiveness of Project Based Learning (PjBL) in improving students' learning outcomes is inseparable from various factors that can affect the quality of learning (Anggraini et al., 2020). Two main factors that are often considered as determinants of learning success are learners' initial abilities and their interest in learning. Learners' initial ability refers to the level of knowledge, skills, and understanding they have before participating in learning (Setiana et al., 2021). In the context of Project Based Learning (PjBL), high initial ability can be an important asset for learners to more easily absorb the material taught, identify problems in the project, and design appropriate solutions(Diana & Saputri, 2021). Conversely, learners with lower initial abilities may take longer to understand the basic concepts required in the project, which could have an impact on their learning process(Istiqomah, 2023). It is important for educators to recognize learners' initial abilities in order to design appropriate learning and provide the necessary support to achieve optimal results (Sulastri & Cahyani, 2021). This variation in initial ability also indicates that a personalized and adaptive approach to learning is needed.

In addition to initial ability, students' interest in learning also plays an important role in determining their learning outcomes(Fitri et al., 2024). This is especially true in project-based learning methods such as Project Based Learning (PjBL). Interest can be defined as the tendency or drive of learners to be interested and involved in a particular activity or topic (Rahmadani & Safitri, 2024). When learners have high interest in a material or type of learning, they tend to be more motivated to actively participate, dig deeper for information, and face challenges with a positive attitude(Aji et al., 2023). In contrast, learners who lack interest or feel that the material is irrelevant to their lives are often discouraged and do not participate optimally, which can negatively impact the quality of their learning outcomes. According to Masrucha et al.(2021) In the context of Project Based Learning (PjBL), where learning relies heavily on active engagement and collaboration, high interest can encourage learners to be more enthusiastic about working in teams. According to Laia & Harefa (2023) This can also spur them to innovate and find creative solutions to the problems given. Teachers are expected to be able to create an interesting and relevant learning atmosphere, as well as linking the projects given to the interests and needs of students.

This study aims to examine in depth the impact of initial ability and learner interest on learning outcomes in Project Based Learning (PjBL). A better understanding of how these two factors interact can provide valuable insights for the development of more effective learning strategies. By knowing the effect of students' initial abilities and interests, educators can design

more targeted learning. According to Ekawati et al. (2021) this allows them to provide the support needed and create a more supportive environment for each learner to achieve optimal learning outcomes. The results of this study are expected to not only contribute to the development of educational theory, but also provide practical guidance for educators to improve the quality of project-based learning in schools, which in turn can advance the education system more thoroughly and inclusively.

Understanding the impact of learners' initial abilities and interests is also important in supporting more targeted curriculum planning and learning evaluation. According to Firmansyah et al. (2023) In Project Based Learning (PjBL), each learner is expected to not only be able to master the knowledge taught, but also develop practical and social skills that are relevant to the real world. The learning outcomes obtained by students are not only measured from cognitive aspects, but also from aspects of collaboration skills, communication, and problem-solving abilities (Suryani et al., 2021). Good initial abilities will accelerate learners in achieving the expected competencies, while high interest will encourage them to be more active in the exploration process and the search for creative solutions. This makes Project Based Learning (PjBL) a very contextual and thorough approach in assessing learners' progress. Through this research, it is hoped that more effective strategies can be found to optimize learner engagement, given factors such as initial ability and interest that are closely interrelated in determining the success of Project Based Learning (PjBL). The findings of this study can provide input for the development of learning methodologies that can be applied at various levels of education, both in primary, secondary and higher education, so that the learning outcomes achieved are more comprehensive and varied according to the needs of students.

## METHODS

### Systematic Literature Review (SLR)

This research uses the Systematic Literature Review (SLR) approach to collect and analyze data related to the topic under study, namely the impact of initial ability and students' interest on learning outcomes in Problem Based Learning (PBL) learning. Systematic Literature Review (SLR) is a method used to evaluate and synthesize relevant research results from previous studies(Larasati et al., 2021). With this approach, researchers can gain a deeper understanding of the issue under study through an organized and systematic analysis of the literature.

In the context of Problem Based Learning (PBL), Systematic Literature Review (SLR) allows researchers to identify various factors that affect learners' learning outcomes, especially their initial abilities and interests. This approach helps researchers to discover emerging patterns in the influence of initial ability and interest on the effectiveness of Problem Based Learning (PBL), as well as uncover gaps in previous research related to the topic. In addition, the Systematic Literature Review (SLR) also provides insight into the limitations of previous studies on the relationship between these factors and success in problem-based learning. Through data collection from various credible sources, the Systematic Literature Review (SLR) provides a more comprehensive and in-depth picture of the relationship between initial ability, learner interest, and learning outcomes in PBL.

### Inclusion Criteria

The following are some of the criteria that guide the collection of articles in this study:

1. The article is the result of research in the field of education
2. Articles published in the last 5 years (2020 - 2024)
3. Articles published in indexed international and national journals
4. Articles with research at the Senior High School (SMA), Vocational High School (SMK), and Higher Education levels
5. Articles that discuss the initial ability and interest of students on learning outcomes in Project Based Learning 5.

**Research Instruments**

The research was organized based on certain criteria, such as journal index, publication year, sample size, education level, demographics, and other factors relevant to learning outcomes in problem-based learning. To collect publications related to this topic, researchers accessed various sources of information, such as databases including Science Direct, Google Scholar, proceedings, and Sinta. The collected data was then analyzed using the Systematic Literature Review (SLR) method.

The data collection process was carried out through several stages, starting with the identification of relevant articles, followed by screening to ensure the quality and eligibility of the sources used, as well as determining whether the articles met the predetermined inclusion criteria. This stage aims to ensure that the data used in this study is in accordance with the focus to be discussed and has a strong relevance to the impact of initial ability and learner interest on learning outcomes in problem-based learning.

**Population and Sample**

The population in this study consisted of all studies, both qualitative and quantitative, that addressed the effect of initial ability and learner interest on learning outcomes in the context of problem-based learning, published in journals indexed in reputable databases such as Proceedings, Science Direct, Google Scholar, and SINTA. The researcher conducted a rigorous selection based on the predetermined inclusion criteria, which included only relevant articles with sufficient methodological quality. The results of this search and selection resulted in 35 articles that met the requirements and relevance for further analysis. The articles were then systematically analyzed to examine the effect of initial ability and students' interest on learning outcomes in problem-based learning.

## RESULT AND DISCUSSION

### Studi Based on Criteria

**Table 1.** Studi Based on Criteria

| *Characteristics Study* | *Criteria* | *Number of Publications* |
|---|---|---|
| *Journal Index* | *Science Direct* | *4* |
| | *Google Schoolar* | *5* |
| | *Prosiding* | *1* |
| | *Sinta 1* | - |
| | *Sinta 2* | *1* |

| | | |
|---|---|---|
| | *Sinta 3* | *8* |
| | *Sinta 4* | *9* |
| | *Sinta 5* | *7* |
| | *Sinta 6* | *-* |
| *Year of Publication* | *2020* | *3* |
| | *2021* | *7* |
| | *2022* | *7* |
| | *2023* | *10* |
| | *2024* | *8* |
| *Sampel Size* | *> 30* | *20* |
| | *≤ 30* | *10* |
| | *Not Mentioned* | *4* |
| *Educational Level* | *Senior High School* | *25* |
| | *Vocational School* | *10* |
| *Demographics* | *Java* | *11* |
| | *Kalimantan* | *2* |
| | *Southeast Nusa Tenggara* | *4* |
| | *Sumatra* | *8* |
| | *Sulawesi* | *2* |
| | *Maluku* | *3* |
| | *Bali* | *1* |
| | *Abroad* | *4* |

Based on the analysis of the 35 journals collected, it can be concluded that research related to the impact of initial ability and learners' interest on learning outcomes in project-based learning (PjBL) includes various approaches and strategies that aim to improve learners' learning outcomes. In this study, the various project-based learning techniques and methods that have been implemented are examined in depth to assess the influence of initial ability and learner interest on the effectiveness of PjBL learning. This includes analyzing each criterion, such as journal index, publication year, sample size, education level, and demographics of the research area. This exploration also involved evaluating the role of learners' prior abilities in influencing their understanding of the material and mastery of the skills required in the project. In addition, the research highlights how learners' interest in the project topic can increase their intrinsic motivation, which in turn contributes to improving the quality of learning outcomes. The findings are expected to provide greater insight into effective ways of designing and implementing project-based learning, with the aim of improving learners' engagement, understanding and overall learning outcomes.

**Study Based on Journal Index**

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**Figure 1.** Journal Distribution Based on Journal Index

Based on the histogram in Figure 1 above, the majority of the analyzed journals were published in Sinta 4 with 9 journals, which is the highest number. This was followed by Sinta 3 with 8 journals. Meanwhile, Sinta 5 has 7 journals, Google schoolar has 5 journals, and Science Direct has 4 journals. Sinta 2 and Proceedings have only 1 journal each. This distribution shows that research on "The Impact of Learners' Initial Ability and Interest on Learning Outcomes in Project Based Learning" has been published in various levels of journals, with a dominance in journals indexed in Sinta 4. These results are not comparable with one another, as it is possible that journals in Sinta 4 are more accessible or have a larger audience, so more researchers publish their research there. In addition, the level of quality or reputation of the journal may also affect the number of publications, where journals with higher rankings such as Sinta 4 tend to be more attractive to researchers who want to gain wider recognition.

**Study Based on Publication Year**

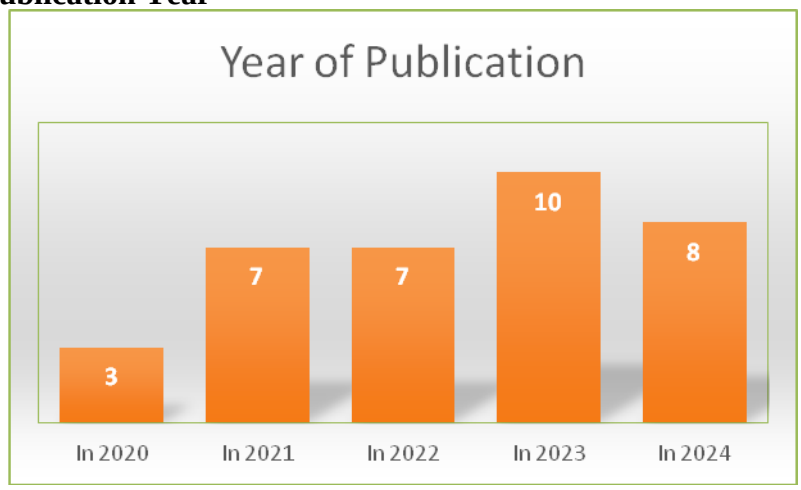


**Figure 2.** Journal Distribution Based on Publication Year

Based on the histogram in Figure 2 above, the journals analyzed are spread over the time span of 2020 to 2024, with the highest concentration in 2023 with 9 journals. Then, publications in 2024 were recorded as many as 8 journals, followed by 2021 and 2022 with 2 journals each and in 2020 with 3 journals. This difference in the number of publications between years indicates an imbalance

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in the distribution of research. Factors such as increased topic relevance in certain periods, for example 2023, may influence the higher number of publications in those years. Meanwhile, in 2020, limited research due to the COVID-19 pandemic may be the main reason for fewer publications. The difference in the number of publications between years can also be caused by the increased interest of researchers in certain topics that are more popular or relevant to the development of science in certain years. In addition, funding factors and research policies at educational institutions or research institutions can also affect the number of publications produced each year.

**Studies Based on Sample Size**

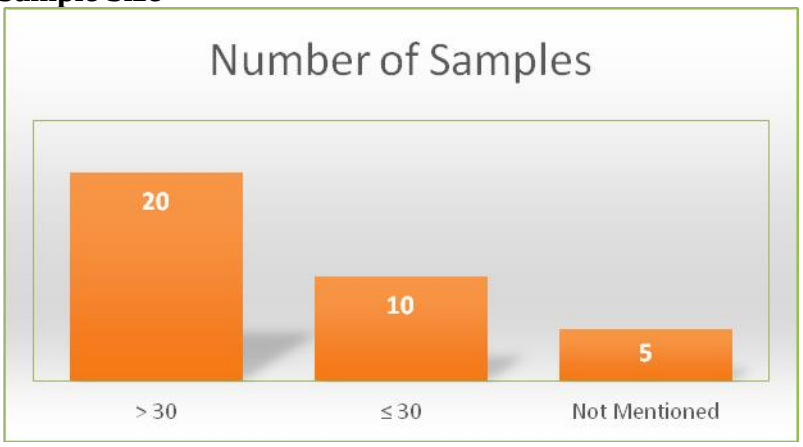


**Figure 3.** Journal Distribution Based on Sample Size

Based on the histogram in Figure 3 above, it is known that most of the journals (20 out of 35) have a sample size of more than 30 respondents used in the research, followed by 10 journals that have a sample of less than 30 respondents in their research, and as many as 5 journals that do not mention the number of research samples used. This shows that most of the studies analyzed tend to use larger samples, which can increase the reliability and validity of the research results. The use of larger samples also allows researchers to obtain more representative results and have better generalizability. Meanwhile, the lack of information on sample size in some journals indicates a lack of transparency in reporting research methodology. The small sample size in some journals may also affect the accuracy of the conclusions drawn from the research, although it can still provide valuable insights into the topics discussed.

**Study Based on Education Level**

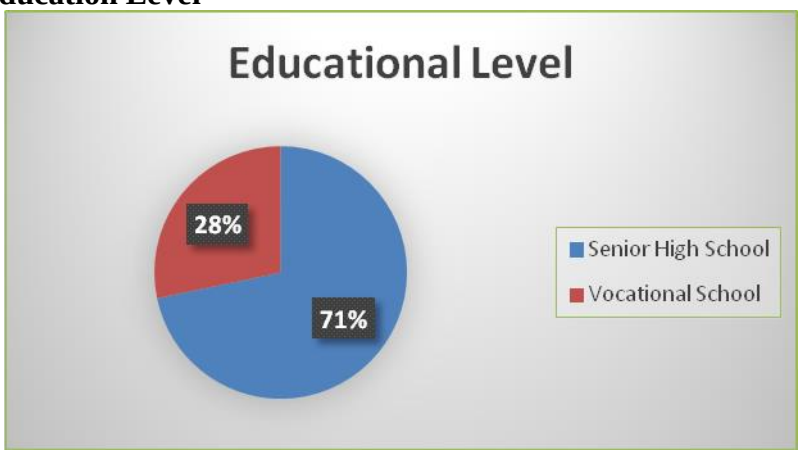


**Figure 4.** Journal Distribution Based on Education Level

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Based on the histogram shown in Figure 4 above, it can be seen that the distribution of the analyzed journals covers various levels of education. A total of 71% (25 journals) came from research conducted at the senior high school level, followed by 28% (10 journals) coming from research at vocational high schools. This imbalance could be due to a greater focus on research at the high school level, which often has a more generalized curriculum and is more widely applied in the context of project-based learning. In addition, high school research may be chosen more often because it is easier to access resources or obtain participants for experiments. On the other hand, research at SMKs may be more limited as it is often related to industry-specific needs or certain skills that do not always fit with project-based learning approaches. Another factor influencing this distribution may be the lack of attention or limited research specializing in SMKs, which often have priorities more focused on developing technical skills than innovative learning methods such as PjBL. Thus, despite the important relevance of SMK in the educational context, research leading to PjBL may be more prevalent in SMA.

**Study Based on Demographics**

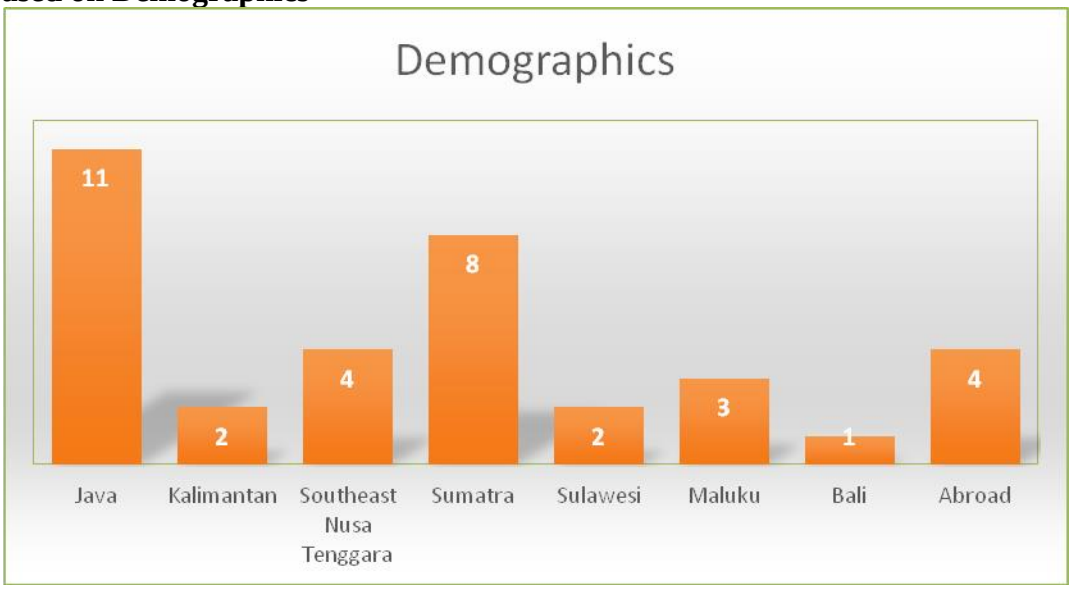


**Figure 5.** Journal Distribution Based on Demographics

Based on the histogram shown in Figure 5 above, the distribution of the analyzed journals shows the diversity of research locations. A total of 11 journals originated from the Java region, followed by 8 journals originating from Sumatra. In addition, there were 4 journals each conducted in Nusa Tenggara and overseas, reflecting an international perspective on this topic. The Maluku region had 3 journals. While Sulawesi and Kalimantan were recorded with 2 journals each. Followed by the Bali region with 1 journal. This difference in the number of publications between regions is likely influenced by the concentration of research and resources available in each region. Java, as the island with the most population and a major education center, tends to have more research being conducted, especially in big cities that have better access to facilities and funding. Sumatra, although smaller, still has a large population, but geographical factors and limited access to research resources may explain the lower numbers compared to Java. Research from overseas adds an international dimension to this topic, but the diversity of overseas locations may be limited by researcher participation or international cooperation. On the other hand, regions such as

Kalimantan, Sulawesi and Bali with fewer journals may indicate that research on this topic is less developed in these areas, or perhaps due to the focus on research with different local contexts.

**Study Analysis**

Based on an in-depth analysis of 35 studies addressing the impact of learners' initial ability and interest on learning outcomes in project-based learning (PBL), some important findings and trends have been revealed. These studies cover a wide range of factors that inform the analysis, such as journal index, year of publication, sample size, education level, and demographic characteristics of the learners involved. These findings provide a strong foundation for formulating recommendations regarding policies and learning practices that are more effective in improving learner learning outcomes through the PjBL approach. The analysis is expected to provide deeper insights into the influence of learners' initial abilities and interests on the effectiveness of project-based learning, as well as how the approach can be adapted to the context of students at different levels of education to improve their academic achievement and practical skills. Thus, this research makes an important contribution in designing more relevant learning strategies that are able to optimize the potential of each learner in the context of project-based learning.

**Table 2.** Journal Analysis Results

| ***No*** | ***Heading*** | ***Research Results*** |
|---|---|---|
| *1* | *The Effect of Project Based Learning Model on Students' Problem-Solving Ability at SMA Negeri 6 Kepahiang (Astria et al., 2024)* | *The results showed that students' initial abilities had an effect of 24.2% on problem solving skills, indicating that students with good initial abilities are easier to develop these skills. The 76.2% effect of PjBL learning model also shows the importance of students' interest and involvement in project-based learning. Students taught with PjBL showed better results in problem solving compared to the conventional model, indicating the effectiveness of PjBL in improving practical skills. This finding confirms that students' initial ability and interest affect their learning outcomes in project-based learning.* |
| *2* | *The Effect of Project-Based Learning Model on Learning Outcomes of Grade X Students at SMA Negeri 11 Samarinda (Anwar et al., 2021)* | *This research reveals how the implementation of Project Based Learning (PjBL) model affects students' learning outcomes. Although the main focus was on the effect of PjBL, learners' initial ability and interest also affected its effectiveness. The results showed a significant increase in student learning outcomes with a gain score of 0.433, indicating an increase in the medium category. This finding confirms that PjBL is effective in improving students' understanding, especially when their initial abilities and interests encourage active participation. With increased student engagement, it is expected that they can more easily connect the concepts learned with the real world.* |

| | | |
|---|---|---|
| *3* | *The Effect of Project Based Learning Model (PjBL) on Student Learning Outcomes on Biodiversity Material in Class X MIPA SMA Negeri 6 Pulau Taliabu (Tamimu et al., 2022)* | *This study aims to determine the effect of Project Based Learning (PjBL) on student learning outcomes on biodiversity material in class X MIPA SMA Negeri 6 Taliabu Island. The t-test results showed no significant effect of PjBL on student learning outcomes, with t-count 0.198 < t-table 1.703 and a significant value of 0.844 > 0.05. The factors of initial ability and student interest play an important role in the effectiveness of learning. Although PjBL is applied, students' initial readiness and interest still affect the achievement of learning outcomes. An approach that considers these factors is expected to increase the effectiveness of PjBL.* |
| *4* | *Development of e-PjBL Model Learning Tools to Improve Cognitive Learning Outcomes in View of Initial Ability on Parabolic Motion Material (Sani et al., 2021)* | *This study used the 4D model development method to develop an e-PjBL learning device at SMA Negeri 1 Rembang, involving 42 students of class X MIPA. The results showed that the device was feasible to improve cognitive learning outcomes, with a contribution of learners' initial ability of 12%. Initial ability and learner interest play an important role in influencing learning outcomes, where high interest supports active engagement in learning. By understanding both, teachers can design more effective learning.* |
| *5* | *Relationship between Learning Interest and Physics Learning Outcomes through Project Based Learning Model in Class XI MIPA SMAN 6 Bengkulu City (Wahyuningsih et al., 2021)* | *This study revealed a significant positive relationship between learning interest and student physics learning outcomes through the Project Based Learning (PjBL) model in class XI MIPA SMA Negeri 6 Bengkulu City, with a correlation of 0.660 and an interest contribution of 43.56%. The indicator "feeling happy" has the greatest influence, with a correlation of 0.669. The findings suggest that learning interest, which is influenced by students' initial ability, plays an important role in improving learning outcomes through project-based learning. Students with high interest tend to be more active in learning and able to connect the material with real life. The PjBL model can be an effective strategy in improving students' interest and learning outcomes, especially if it is tailored to the characteristics of their initial abilities.* |

Learners' prior abilities and interests play a very important role in influencing learning outcomes in project-based learning (PjBL). Good initial ability allows students to more easily develop their practical skills, such as problem solving, which is one of the main focuses in PjBL. In addition, high interest also has a big influence in improving students' engagement and understanding of the material being studied. Students who have high interest will more actively participate in the learning process, which in turn can improve their learning outcomes. Conversely, if there is a mismatch between students' initial abilities and the PjBL approach, or if students'

interest is low, the effectiveness of this learning model can be reduced. Designing PjBL activities that match students' ability levels and interests is essential to maximize the learning outcomes achieved and support the optimal development of students' skills.

In addition, a deeper understanding of the relationship between learners' initial abilities and interests can help teachers to design more effective learning strategies. By recognizing students' ability levels and interests, teachers can adjust the methods and materials used in project-based learning, so that each student can be actively involved and achieve optimal results. PjBL tailored to students' individual needs not only improves conceptual understanding, but also develops practical skills such as collaboration, communication and creativity. This will better prepare students to face challenges in the real world, strengthening their ability to solve problems independently and in groups.

## DISCUSSION

This study examines the impact of learners' initial ability and interest on their learning outcomes in Project Based Learning (PjBL) based learning. Based on a literature review of 35 journals covering international and national research, it was found that students' initial ability and their interest play an important role in the effectiveness of PjBL learning. Students with higher initial ability tend to understand the material taught through the PjBL method more easily, while high interest can increase their involvement in the learning process. The application of PjBL provides practical experience for students that allows them to learn directly through projects, however, the success of this method is greatly influenced by students' initial readiness and their interest in the topic being taught. The Project Based Learning (PjBL) model can be more effective if students have high interest and good initial ability, as both contribute to deeper understanding and more optimal learning outcomes. These findings underscore the importance of considering students' individual factors in designing project-based learning.

Students' prior abilities play an important role in determining their success in project-based learning. Research shows that students with better initial abilities tend to adapt more quickly to the demands of project-based learning, as well as more easily develop the skills required in the process. Astria et al. (2024) revealed that students' initial ability contributed 24.2% to their problem-solving ability. This finding is in line with the results of Sani et al. (2021), who found that the contribution of initial ability to students' cognitive learning outcomes in project-based learning reached 12%. Similar results were also found in a study by (Mulyono & Agustin, 2020), which revealed that the PjBL learning model was more effective than the conventional model in improving student learning outcomes, especially in those with better initial abilities. Students' initial ability plays a key role in enabling them to better understand the material and utilize the opportunities provided in project-based learning.

Learners' interest was also shown to have a significant influence on their learning outcomes in PjBL. Students who have high interest in the material being taught tend to be more active in participating in learning, which has a positive impact on their understanding of the material. Research conducted by (Anwar et al., 2021) showed that students' interest can improve their learning outcomes in project-based learning. Similar results were also found in a study by Wahyuningsih et al. (2021), who found a significant positive relationship between students' learning interest and their learning outcomes in PjBL-based physics learning. High interest contributes to

greater involvement in the project, which makes students more motivated to achieve better results. Furthermore, research by Rahmadani & Safitri (2024) confirmed that high learning interest can encourage the achievement of more optimal learning outcomes, especially when students have the opportunity to work on projects that match their interests.

In addition, students' emotional and social engagement in project-based learning is also influenced by their interest in the material being taught. Learning models such as PjBL-STEAM that integrate science, technology, engineering, art, and math can increase students' emotional engagement. Research by Diana & Saputri (2021) shows that PjBL-STEAM not only improves critical thinking skills, but also students' emotional intelligence, which shows the relationship between initial ability and students' interest in project-based learning. The results of Purba & Munzirwan's research (2022) show that the application of PjBL can improve students' chemistry learning outcomes, especially when students' interest in the topic studied is higher. Kencana & Rifa'i (2022) also suggested that PjBL is more effective in improving students' cognitive learning outcomes compared to conventional methods. This suggests that students' interest plays an important role in supporting their active engagement in the project, which in turn improves their understanding and the skills they acquire.

## CONCLUSION

The conclusion of this study shows that the initial ability and interest of learners have a very important role in influencing their learning outcomes in Project Based Learning (PjBL) based learning. Students who have better initial ability tend to understand the material faster and are able to overcome the challenges that arise during the project-based learning process. This shows that students' initial readiness greatly influences the effectiveness of the PjBL method. In addition, high interest in the topic taught was also shown to increase student engagement and motivation, which ultimately contributed to more optimal learning outcomes. This research underscores the importance of paying attention to students' abilities and interests in designing project-based learning activities. If these two factors are considered, then the implementation of PjBL will be more effective in achieving maximum learning outcomes for students.

## CONFLICTS OF INTEREST STATEMENT

Regarding this study, the author declares that there is no conflict of interest.

## AUTHOR CONTRIBUTIONS

Study concept and design: Ulfi Lathifah. Acquisition of data: Aswardi Aswardi. Analysis and interpretation of data: Yeka Hendriyani. Drafting the manuscript: Ulfi Lathifah. Critical revision of the manuscript for important intellectual content: Ari Syaiful Rahman Arifin. Statistical analysis: Nurul Ulfi Lathifah.

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