

THE EFFECT OF THE PROJECT BASED LEARNING (PjBL) LEARNING MODEL ON DISCIPLINE AND COLLABORATIVE SKILLS IN BIOLOGY LEARNING OF GRADE X STUDENTS OF SMAN 2 PAMEKASAN

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Abstract

This study aims to analyze the effect of the Project Based Learning (PjBL) learning model on the discipline and collaboration skills of 10th grade students in Biology learning at SMAN 2 Pamekasan. The background of this study is based on low learning discipline, less than optimal compliance with practicum procedures, and weak group cooperation in biology project activities. The study used a quantitative approach with a quasi-experimental design and involved two classes as samples. Data collection instruments were questionnaires, observation sheets, and project performance assessments. The results showed that PjBL had a significant influence in improving student discipline through strengthening time management, consistency in task completion, and compliance with scientific instructions. In addition, PjBL was also proven to improve collaboration skills, especially in aspects of communication, role division, conflict resolution, and group responsibility. These findings emphasize that PjBL is worthy of being recommended as an effective learning model to develop 21st-century character and skills in Biology learning.

Keywords: Project Based Learning, discipline, collaboration skills, biology learning, high school students.

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INTRODUCTION

Curriculum changes in Indonesia direct learning practices towards more flexible, contextual processes and emphasize competency development. The Independent Curriculum provides teachers with the space to design adaptive learning, while students are given greater opportunities to develop higher-order thinking skills, collaborative skills, and personal character that are relevant to the demands of the 21st century (Saputra, AA, & Stiawan, A. (2024). In this context, the project-based learning model is one of the pedagogical approaches that is considered capable of addressing the various limitations of conventional learning. Biology learning as a discipline that relies on scientific processes, empirical observation, and laboratory work, requires students to not only master concepts, but also to be directly involved in scientific practices that require precision, compliance, and good cooperation (Nasrullah, A., Judijanto, L., & Sepriano, S. (2024). However, the real conditions at SMAN 2 Pamekasan show challenges in internalizing these character aspects. The results of initial observations on grade 10 students show that some students have not demonstrated adequate discipline. Delays in submitting practical assignments, low independence in preparing tools and materials, and irregularity Difficulties in following experimental procedures are some of the frequently encountered symptoms. At the same

time, group interaction during discussions and projects also appears suboptimal. Some students tend to be passive, while others take over tasks without equal coordination, resulting in unbalanced collaboration.

This phenomenon has direct implications for the quality of biology learning. Discipline in following scientific procedures is a crucial prerequisite for producing accurate data, while collaboration is necessary for interpreting findings and solving complex problems. When these two aspects do not develop proportionally, the learning process becomes less effective, and learning outcomes have the potential to be suboptimal (Mugara, R., & Ali, EY (2025). Therefore, a learning model is needed that not only teaches Biology material, but also instills the personal and social skills needed by students. The Project Based Learning (PjBL) learning model is seen as a relevant solution. PjBL focuses on project activities that require students to conduct in-depth investigations into a topic, plan work steps, divide roles in groups, and produce tangible products as a form of their understanding. These characteristics are directly related to aspects of discipline and collaboration. In the context of discipline, PjBL encourages students to manage time, follow project work procedures, and be responsible for the final results (Purwowidodo, A., & Zaini, M. (2023). Meanwhile, in the context of collaboration, PjBL requires effective communication, team agreement, conflict resolution, and positive interdependence between group members. Various previous studies support this assumption. Afitri (2022) proved that PjBL has a significant effect on the collaboration skills of elementary school students.

Similar findings were presented by Anggraeni (2024), who reported a significant increase in students' collaborative skills in science learning after the implementation of PjBL. Meanwhile, research by Suaidiah (2024) showed an increase in collaboration skills and learning outcomes in high school students in ecosystems material through the implementation of PjBL. Furthermore, research by Kamal (2023) also emphasized the role of PjBL in shaping student character such as discipline, responsibility, and creativity. However, research related to the influence of PjBL on discipline and collaborative skills simultaneously in the context of high school Biology learning is still relatively limited, especially in schools in Pamekasan Regency. In fact, Biology learning has unique characteristics that require strict procedural understanding, solid teamwork, and good scientific communication. This underpins the importance of this study to empirically test the effectiveness of PjBL in this context. Thus, this study is directed at two main focuses. First, to examine the extent to which PjBL can improve student discipline in Biology learning. Second, to examine the influence of this model on the development of collaborative skills of grade 10 students at SMAN 2 Pamekasan. This research is expected to contribute to the development of project-based learning models that not only promote cognitive achievement but also instill values and social skills essential for students' futures. Furthermore, the research findings can serve as a basis for teachers and schools in designing more effective learning, particularly in subjects requiring procedural work such as Biology.

RESEARCH METHOD

The research method used in the study entitled *The Effect of Project Based Learning (PjBL) Learning Model on Discipline and Collaboration Skills in Biology Learning of Class X Students of SMAN 2 Pamekasan* is a quantitative method with a quasi-experimental research type. This study uses a nonequivalent control group design, which involves two groups that are not selected randomly, consisting of an experimental class that is given treatment in the form of the application of the Project Based Learning (PjBL) learning model and a control class that uses a conventional learning model (Tasya, NA (2025). The research subjects are class X students of SMAN 2 Pamekasan who are selected

through purposive sampling techniques by considering the equality of students' initial abilities. Data collection techniques are carried out through observation to measure the level of discipline and collaboration skills of students, questionnaires as supporting instruments, and documentation to strengthen research data. The data obtained are then analyzed using inferential statistical tests, such as normality tests, homogeneity tests, and hypothesis tests using the "t" test or MANOVA test, to determine the effect of the application of the PjBL model on students' discipline and collaboration skills in Biology learning.

RESEARCH RESULTS AND DISCUSSION

A. The Influence of PjBL on Student Discipline

Project-Based Learning (PjBL) significantly impacts student discipline because it positions students as the primary subjects in the learning process. In PjBL, students are not only required to understand the material but also to manage their time, assign roles, and complete tasks according to agreed-upon stages. This approach indirectly trains students to adhere to schedules, respect group rules, and be accountable for achieving targets. Discipline does not come as a coercion from the teacher, but rather grows from the awareness that delays or negligence will impact the success of the project as a whole (Junita, ER, Karolina, A., & Idris, M. (2023). In addition, PjBL encourages students to be disciplined in the learning process and attitude. Every stage of the project from planning, implementation, to evaluation requires consistency and perseverance. Students learn that good results can only be achieved through regular and continuous work. The habit of recording progress, reflecting, and correcting mistakes trains them to be more orderly and systematic. Thus, discipline is not only reflected in compliance with school rules, but also in the ability to control oneself in completing academic tasks. The influence of PjBL on student discipline is stronger when the teacher acts as a facilitator who provides trust and proportional learning space. This trust fosters a sense of personal and collective responsibility in students (Ainurrohman, MT, Desstya, A., & Artik, A. (2024). They realize that the freedom given must be balanced with a disciplined attitude so that learning objectives are achieved. In this context, PjBL is not just a learning strategy, but rather a means of developing disciplined character that is relevant to the demands of real life and the future world of work. Project Based Learning (PjBL) has a significant influence on improving student discipline because this learning model positions students as active subjects in the learning process. In PjBL, students are required to plan, implement, and complete a project within a certain time period (Nurhamidah, S., & Nurachadijat, K. (2023). This condition indirectly trains students to adhere to schedules, follow work rules, and be responsible for tasks that have been mutually agreed upon. With clear targets and deadlines, students learn that discipline is the main key to project success. In addition, PjBL encourages discipline through the habit of structured time management.

Each stage of the project, from planning, data collection, to presenting results, requires effective time management. Students who are not disciplined in managing their time will have difficulty completing projects optimally (Nurhadiyati, A., Rusdinal, R., & Fitria, Y. (2020). Therefore, PjBL significantly raises students' awareness that delays and negligence will have a direct impact on the quality of their learning outcomes. The influence of PjBL on discipline is also seen in the increased individual and group responsibility. In project work, each student has a role that must be carried out according to agreement. The indiscipline of one member can hinder the performance of the entire group, resulting in social control that encourages students to be more obedient to the rules. This situation instills the value of discipline not only as a personal obligation, but also as a form of social responsibility. Furthermore, PjBL builds internal discipline, not just because

of external pressure. Students become disciplined because they understand the learning objectives and benefits of the projects they are working on, not just because they are afraid of teacher punishment. Active involvement and the relevance of the project to real life make students have intrinsic motivation to be disciplined, such as arriving on time, following procedures, and completing assignments according to provisions (Farisah, SH, & Wafiqah, S. (2025). Thus, it can be emphasized that PjBL has a positive and sustainable impact on student discipline. This learning model not only improves academic outcomes but also fosters disciplined character through contextual and meaningful learning experiences. Therefore, the implementation of PjBL is worthy of consideration as an effective learning strategy for building student discipline in the school environment.

B. The Influence of PjBL on Collaborative Skills

Project Based Learning (PjBL) has a significant impact on the development of collaboration skills because it places students in collaborative work situations that require active and continuous interaction. Through project work, students learn to share ideas, listen to others' opinions, and reconcile different perspectives to achieve common goals (Fatiati, NA (2023). The discussion and decision-making processes that occur naturally in groups form collaborative working habits that cannot be acquired through individual learning. Thus, collaboration is not only understood as working in a group, but as the ability to build understanding and trust between team members. In addition, PjBL trains students to develop collective responsibility in completing tasks. Each group member has an interrelated role, so that the success of the project depends heavily on the contribution of each individual. This condition encourages students to be cooperative, respect the division of tasks, and complete work according to agreement (Koba'a, H., Jumahir, J., & Mawaddah, M. (2025). When obstacles or differences of opinion arise, students learn to manage them through open communication and shared solutions, so that collaboration skills develop along with the ability to solve problems as a team.

The impact of PjBL on collaboration skills is also evident in the growth of social awareness and empathy among students. Intense interaction during the project process makes students more sensitive to the needs and abilities of their teammates. They learn to adapt, provide support, and accept criticism constructively. In the long term, this collaborative experience equips students with collaborative skills relevant to social life and the professional world, where success is often determined by the ability to collaborate effectively (Darel, NS (2024). Project Based Learning (PjBL) is a learning model that positions students as active subjects in the learning process through group project work. This model requires intensive interaction between group members to plan, implement, and evaluate the projects being worked on. Therefore, PjBL directly encourages students to develop collaborative skills, such as the ability to work together, share roles, and achieve common goals. Without good collaboration, project completion will be difficult to achieve optimally. The implementation of PjBL trains students to communicate effectively in groups. In each stage of the project, students must convey ideas, listen to the opinions of others, and hold discussions to make joint decisions. This process accustoms students to respect different points of view and build agreements democratically. Thus, collaborative skills are not only formed technically, but also socially and emotionally (Pahmi, S., Juliana, E., Yulizha, AF, & Kurniawan, AD (2025). In addition, PjBL demands There is a clear division of tasks among group members. Each student has specific responsibilities according to their agreed-upon roles, so the success of the project depends on the contribution of all members.

This condition trains students to trust each other, be responsible, and realize the importance of teamwork. Through this experience, students learn that effective collaboration can improve the quality of work results compared to individual efforts. PjBL

also provides a space for students to resolve conflicts that arise during group work. Differences in opinion, work styles, and ability levels often pose challenges in collaboration. However, through teacher guidance, students are guided to resolve conflicts constructively and find solutions together. This experience strengthens collaboration skills because students learn to manage emotions, negotiate, and maintain positive working relationships (Amin, AM, Karmila, F., & Adiansyah, R. (2025)). Thus, it can be concluded that PjBL has a significant influence on improving students' collaboration skills. Through project activities that require group work, communication, responsibility, and joint problem solving, students not only gain academic knowledge but also important social skills. Therefore, PjBL is suitable to be implemented as a learning strategy to prepare students to face real-world challenges that require the ability to work collaboratively.

C. The Role of PjBL in Biology Learning and the Integration of the Two

Project-Based Learning (PjBL) plays a crucial role in biology learning because it bridges abstract scientific concepts with real-life learning experiences. Biology, as the study of living things and their environment, demands an understanding that is not only theoretical but also contextual. Through PjBL, students are invited to observe biological phenomena around them, formulate problems, and develop solutions based on scientific concepts (Taqiya, RI, Shaumi, NM, Al Zenyta, NF, Fitri, MA, & Suryanda, A. (2024)). This process makes biology learning more meaningful because students understand that the knowledge learned has a direct relationship with everyday life. In addition to deepening conceptual understanding, PjBL also plays a role in developing science process skills that are characteristic of biology learning. Activities such as observation, data collection, analysis, and drawing conclusions are naturally integrated in the implementation of the project. Students do not only receive information from the teacher, but are actively involved in building knowledge through direct learning experiences (Umar, MA (2018)). Thus, biology learning is no longer centered on memorization, but on scientific thinking skills and evidence-based problem solving. The integration of PjBL in biology learning creates harmony between mastery of concepts, skills, and scientific attitudes. PjBL provides space for students to work together, be responsible, and show concern for the environment as an object of biological study. This integration makes learning more holistic, because students not only understand the material biology academically, but also internalize scientific values in their behavior and way of thinking. Thus, PjBL and biology learning mutually reinforce each other in forming students who are critical, creative, and have scientific character. Project-Based Learning (PjBL) plays a strategic role in biology learning because of its characteristics that emphasize real-world problem-based learning and scientific processes (Sadikin, A. (2024)).

Biology, as the study of life, is highly relevant for teaching through projects, as many of its concepts are directly related to natural phenomena and the surrounding environment. Through Project-Based Learning (PjBL), students not only receive concepts theoretically but also actively engage in observing, researching, and analyzing biological objects contextually. This makes learning more meaningful and encourages a deeper understanding of concepts. Furthermore, Project-Based Learning (PjBL) plays a crucial role in developing science process skills in biology learning. Project activities require students to design experiments, collect data, test hypotheses, and draw conclusions based on scientific evidence. This process is in line with the scientific approach that is the basis of Biology learning (Ristiani, R., Ali, A., & Apriyanto, A. (2025)). Thus, PjBL not only strengthens mastery of the material, but also trains critical, analytical, and systematic thinking skills that are very necessary in understanding biology. The integration of PjBL in Biology learning also encourages the formation of scientific attitudes and concern for the environment. Many Biology projects are related to ecological, health, and conservation

issues, such as waste management, ecosystem observation, or health campaigns (Zuhaida, A. (2023). Through these projects, students learn to be responsible, work together, and have an awareness of the impact of human activities on living things. Therefore, the integration of PjBL is not only oriented towards cognitive achievement, but also on the formation of character and an attitude of environmental concern (Suryani, Y. (2024). Furthermore, the integration of PjBL in Biology learning can increase students' motivation and independence in learning. Projects that are designed in an interesting and relevant way to everyday life make students feel they have a clear purpose in learning. They are encouraged to seek information independently, discuss, and solve problems together in groups. This situation makes students active subjects in learning, while the teacher acts as a facilitator who guides the learning process. Thus, the role of PjBL in Biology learning is very significant and complementary. Biology provides a rich scientific context for project development, while PjBL is an effective strategy for implementing active, contextual, and meaningful learning. The integration of the two can create Biology learning that focuses not only on mastery of the material but also on the development of 21st-century skills and character building of students.

CONCLUSION

The results of the study indicate that the Project Based Learning model has a strong and consistent influence on improving discipline and collaboration skills in grade X students of SMAN 2 Pamekasan. Through structured project stages, students are trained to manage time, comply with scientific procedures, and complete tasks on schedule. At the same time, project-based learning requires active involvement in groups so that communication skills, sharing responsibilities, managing conflicts, and reaching agreements are further developed. This model has proven relevant for application in Biology learning that demands accuracy, empirical work, and coordination within a team. Thus, PjBL not only supports students' academic achievement but also forms character and essential 21st-century competencies.

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