Vol. 2 No. 3 Edisi Juli 2025 E. ISSN. 3032-2472
Multidisciplinary Indonesian Center Journal (MICJO)
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BUILD UNDERSTANDING STUDENT ABOUT METHOD WORK LUNGS THROUGH PROJECT-BASED EXPERIMENTS AT SDN 188 PEKANBARU

MEMBANGUN PEMAHAMAN SISWA TENTANG METODE KERJA PARU-PARU MELALUI EKSPERIMEN BERBASIS PROYEK DI SDN 188 PEKANBARU

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DOI: https://doi.org/10.62567/micjo.v2i3.911

Article info:

Submitted: 10/06/25 Accepted: 14/07/25 Published: 30/07/25

Abstract

Science education at the elementary school level has an important role in shaping scientific thinking and improving students' understanding of natural concepts, one of which is the human respiratory system. In this case, the lungs become organ vital Which worthy introduced through method interesting and applicable learning. This study aims to describe how the understanding of fifth grade students of SDN 188 Pekanbaru can be improved through project-based experiments on how the lungs work. This experimental method is designed with an active and contextual learning approach, where students are directly involved in the process of making a lung model using simple tools and materials. The results show that student involvement in experiment based on project capable increase enthusiasm learning and conceptual understanding significantly. In addition, this activity also trains critical thinking skills, teamwork, and scientific communication. These findings underscore the importance of integrating a project-based experimental approach in learning Science. Through activity This, Teacher No only teach theory, but also provide meaningful learning experiences that can improve students' overall learning outcomes.

Key Word: system breathing, lungs, experiment, project, learning Science

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Abstrak

Pendidikan sains di jenjang sekolah dasar memiliki peran penting dalam membentuk cara berpikir ilmiah dan meningkatkan pemahaman siswa terhadap konsep-konsep alam, salah satunya sistem pernapasan manusia. Dalam hal ini, paru-paru menjadi organ vital yang patut dikenalkan melalui metode pembelajaran yang menarik dan aplikatif. Penelitian ini bertujuan untuk menggambarkan bagaimana pemahaman siswa kelas V SDN 188 Pekanbaru dapat ditingkatkan melalui eksperimen berbasis proyek tentang cara kerja paru-paru. Metode eksperimen ini dirancang dengan pendekatan pembelajaran aktif dan kontekstual, di mana siswa dilibatkan langsung dalam proses membuat model paru-paru menggunakan alat dan bahan sederhana. Hasil menunjukkan bahwa keterlibatan siswa dalam eksperimen berbasis proyek mampu meningkatkan antusiasme belajar dan pemahaman konseptual secara signifikan. Selain itu, kegiatan ini juga melatih keterampilan berpikir kritis, kerja sama tim, dan komunikasi ilmiah. Temuan ini menggarisbawahi pentingnya integrasi pendekatan eksperimen berbasis proyek dalam pembelajaran IPA. Melalui kegiatan ini, guru tidak hanya mengajarkan teori, tetapi juga memberikan pengalaman belajar bermakna yang dapat meningkatkan hasil belajar siswa secara menyeluruh.

Kata kunci: sistem pernapasan, paru-paru, eksperimen, proyek, pembelajaran IPA

1. INTRODUCTION

Currently, education in elementary schools is faced with a major challenge in fostering students' understanding of abstract scientific concepts, such as the organ system in the human body. One important part of this organ system is the respiratory system, especially the lungs. The lungs have a vital function in supporting human life, namely as a place for the exchange of oxygen and carbon dioxide gases. However, students' understanding of how the lungs work is often shallow and limited to memorizing theory. Therefore, a learning approach is needed that is able to connect abstract concepts with students' concrete experiences in the classroom (Restian & Widodo, 2019) .

This is reinforced by the results of observations at SDN 188 Pekanbaru, which show that most fifth grade students have difficulty in understanding the human respiration process as a whole. When the teacher delivers the material system breathing, Lots student Which only capable remember names of organs without understanding how the organs work in an integrated manner. In fact, science learning should not only focus on mastering the material, but also on the formation of scientific attitudes and science process skills that involve observation, experimentation, and analysis.

Based on the description, the influence of using project-based experiments in science learning is important to study because it can provide opportunities for students to be actively involved in the learning process. By involving students in general straight in making a lung model, they can experience for themselves how the lungs work when we breathe. This process

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allows student understand material No only through explanation verbal, but also through memorable and memorable direct experiences (Bupu et al., 2025) .

Project-based experiments are one of the learning strategies that emphasize active and collaborative processes. Students not only listen to the teacher's explanation, but also work in groups to design and implement simple scientific projects. In the context of learning about the lungs, students can be invited to make a respiratory model from simple materials such as plastic bottles, balloons, and straws. By practicing how the lungs work visually and kinesthetically, it is hoped that understanding they to draft breathing will increase in a way significant (Rahman, 2022) .

Learning with an experimental approach is also in line with the Independent Curriculum which emphasizes the importance of experiential learning. In science learning, students are invited to observe, investigate, and discover scientific concepts themselves through fun and meaningful activities. The teacher acts as a facilitator who guides the process. student exploration, not just information providers. This is expected to be able to change the learning paradigm from being teacher-centered to being student-centered.

Project-based learning can also enhance 21st century skills, such as critical thinking, creativity, collaboration, and communication. As students create lung models, they are faced with a variety of challenges that require breakdown problem, taking decision, And Work The same team. In addition, students also learn to convey the results of their projects to friends, which can train their scientific communication skills. This activity not only improves conceptual understanding but also develops character and soft skills that are important for students' future (Zulpikar et al., 2023) .

In addition, the selection of project-based experimental methods also takes into account the characteristics of elementary school students who tend to like to move, try new things, and learn through direct experience. By providing chance to student For involved in experiment, they will be more motivated to learn and understand science concepts more deeply. This experiment can be a bridge between theory and practice that helps students build knowledge through real experiences.

This research was conducted at SDN 188 Pekanbaru by involving fifth grade students as subjects. Experimental activities were carried out in two meetings, namely the first meeting for the introduction and discussion of the concept of breathing, and the second meeting for the second For implementation project experiment. In activity This, Students are divided into small groups and guided to create and observe how a lung model works. Each group is then asked to present their findings in front of the class.

Data collected through observation during activity ongoing, interview short with student, And test understanding after experiment. Results data Then analyzed For see improvement students' understanding of the concept of breathing and how the lungs work. It is hoped that the findings from study This can give contribution in development learning strategies Science in school base, specifically in material system organ man.

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In addition, the results of this study are also expected to be an inspiration for science teachers in elementary schools to implement project-based learning in activity Study teach. With use tool props simple and interesting experiments, teachers can increase students' learning motivation and help they understand material in a way more Good. Matter This very relevant to the spirit of the Independent Curriculum which gives teachers the freedom to develop method learning Which in accordance with need student.

In the context of science learning, experiments play an important role in helping students build strong conceptual understanding. Through experiments, students not only know that a concept is true, but also understand why and how the concept occurs. This is the essence of true science learning: not just memorizing facts, but experiencing and understanding the scientific process directly (Sugrah, 2019) .

Thus, it is important for every teacher to continue to develop strategies. learning Which innovative And contextual. Wrong One approach Which can be used is a project-based experiment, which combines creative, scientific, and collaborative elements in one activity. In learning about the lungs, this approach has proven effective in improving students' understanding and skills, as well as creating a fun and meaningful learning atmosphere.

Through this article, it is hoped that it can provide a comprehensive overview of the application of project-based experiments in learning. system breathing, specifically method Work lungs, in school basis. By referring to the research results at SDN 188 Pekanbaru, this article also aims to For give recommendation practical for Teacher And practitioner education in designing learning Science Which more active, creative, and have an impact on student learning outcomes.

2. RESEARCH METHOD

The writing method used in this article is a descriptive qualitative research method. Qualitative methods are methods used to understand phenomena in a natural context by describing in depth the conditions of the objects being studied. This approach was chosen because it is appropriate for describing the learning process and the influence of experiments. based on project to understanding student about method Work lungs. Study This No focus on measurement number or statistics, but more emphasis on the process, student experiences, and learning dynamics that occur in the classroom (Rukin, 2019) .

Research was conducted in SDN 188 New York on semester even academic year 2024/2025. The subjects in this study were grade V students consisting of 20 person, with range age 10 until 11 year. Class V chosen Because at this level students begin to study the human respiratory system material according to the applicable curriculum. Researchers work with class teachers to design and implement learning with a project-based experimental approach, especially for material on how the lungs work.

The data collection techniques used include direct observation during the learning process, short interviews with students and teachers, and providing an understanding test in

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the form of LKPD after the experimental activity was carried out . Observations were made to see student involvement during the experimental process and the extent to which they understood the concept of breathing. Interviews were used to explore students' responses to the experimental activities and their understanding after activity ongoing. Temporary That, test used For measure the increase in students' cognitive knowledge regarding the respiratory system, especially the function and how the lungs work.

The project-based experimental design used in this study centered on the creation of a simple lung model. Students were divided into 4 group small Which each consists of from 5 person. Each group given tool And material For make model lungs, that is bottle used plastic, two small balloons, one large balloon, straws, plasticine and insulation. After all the tools available, student guided For compile tool the become A a lung model that is able to demonstrate the process of inspiration and expiration.

In its implementation, learning begins with apperception and a brief explanation of the human respiratory system. Next, the teacher facilitates students for make model lungs based on directions Which has been prepared. Students are given about 45 minutes to complete their models, then observe how the models they have created work. After experiment finished, student requested to discuss results his observation a and fill in the questions in the LKPD in groups, then present them in front of the class. This activity ends with reflection and giving a comprehension test as an evaluation of learning outcomes.

Data from observations, interviews, and tests were analyzed descriptively qualitatively. Observation data were analyzed to see students' involvement in the experimental process and their affective and psychomotor responses. Interview data were analyzed to determine students' perceptions of the learning activities carried out. Meanwhile, comprehension test data were analyzed to determine the extent to which understanding conceptual student increase after follow experiment.

The analysis was carried out by looking at the final test results and observing changes in student attitudes and behavior during learning.

The validity of the data in this study is maintained through data triangulation, namely by comparing the results of observations, interviews, and tests. Thus, the data obtained can provide a complete and comprehensive picture of effectiveness experiment based on project in increase students' understanding of the respiratory system. In addition, teacher reflection as a facilitator is also used to strengthen the interpretation of the results and assess the success of the implementation of the applied learning methods.

With this research method, it is hoped that a clear picture will be obtained and concrete about implementation learning experiment based on project in SDN 188 Pekanbaru and its impact on improving the understanding of fifth grade students about how the lungs work. This study is also expected to be a practical reference for elementary school science teachers in designing innovative and enjoyable learning.

3. RESULTS AND DISCUSSION

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A. Introduction System Concept Breathing Man And Role Lungs

Learning begins with an introduction to the concept of the human respiratory system which includes the main organs such as the nose, throat, trachea, bronchi, and lungs. At this stage This, the teacher conveys material through visual media in the form of human anatomy images and short videos about the respiratory process. The purpose of this stage is to build students' basic understanding of the importance of the respiratory system for human life. Based on the results of observations, most students showed high enthusiasm when shown visual media. They actively answered the teacher's questions and showed curiosity about how the lungs work in the body. Understanding this beginning is important because of being foundation for experiment that will be done.

In the initial discussion activity, students are invited to think critically about why humans have to breathe and what happens if breathing is disturbed. The teacher provokes students with questions such as "Why do we get tired when running?" And "What Which happen If nose clogged?" Questions this is capable push students for think And connect experience their personal with the material being studied. Through this activity, students begin to realize that breathing is not just an automatic activity, but a biological process that involves the work of various organs, especially the lungs.

Next, the teacher introduces the basic concept of how the lungs work through a brief explanation and a simple analogy. The teacher explains that the lungs work like a balloon that expands when filled with air and deflates when air is released. This explanation is assisted by a demonstration using a balloon that is blown up and deflated. From the results of a brief interview, many students said that they had just understood that air enters and exits the lungs every time they breathe. This activity has proven effective in linking abstract concepts to students' everyday concrete experiences, making it easier for them to understand the material (Carnegie, 2011) .

Once students have gained a basic understanding of the structure and function of the lungs, teachers begin to introduce project-based experiments as an approach. For learn more carry on method Work lungs. Teacher explains that in activity This, student will make model lungs from simple materials that have been provided. The purpose of this experiment is for students to see and feel for themselves how the lungs work when we breathe. Explanations of the procedures and tools that will be used are presented in detail so that students are ready carry out activities in an orderly and safe manner.

Before start experiment, student shared to in group small. Each group consists of 5 people. The teacher gives One set tool And material to every group, including bottle used plastic, two balloon small, One balloon big, straw, plasticine And isolation. Student given time to design and construct their lung models based on the instructions given. During this process, the teacher acts as a facilitator who guides, helps groups that are having difficulties, and ensures that all students are actively involved in the model-making process.

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Figure 1. Students try to make a lung model.

The process of making the lung model went smoothly and enthusiastically. Students seemed enthusiastic and worked together in assembling the model components. They discussed with each other how to connect the straw to the balloon and how to place the balloon on the mouth of the bottle. Some groups experienced technical difficulties such as broken balloons or loose straws, but this became a meaningful learning moment because students were invited to find solutions and improve their models. Based on observations, this activity was very effective in building teamwork and honing students' problem-solving skills directly.

Once the model is complete, students begin testing how the model works. With interesting balloon big to lower, student see balloon small in in the bottle expands, imitating the process of inspiration or the entry of air into the lungs. When balloon big pressed to on, balloon small deflate, copy process expiration or the release of air from the lungs. Students seemed amazed to see how their models could work like human lungs. Many of them gave comment like "So, this is how the lungs work, huh, sis?" "Oh, So This method Work lungs yes, interesting!" or "It turns out that the lungs can expand and contract like this." From the results of this observation, it can be concluded that this experiment succeeded in changing abstract concepts into concrete experiences that are easy for students to understand.

B. Analysis of the Application of Project-Based Experiments on Students' Conceptual Understanding

Project-based experiments applied in learning the respiratory system, especially how the lungs work, have been shown to have a positive impact on students' conceptual understanding. This can be seen from the increase in the results of the understanding test given before and after the experiment was carried out. Before the experiment, most students only knew that the lungs were used for breathing, but they did not understand the process that occurs when air enters and exits the body. After the experiment and group discussions, students began to be able to explain the breathing process more completely, such as the role of the diaphragm, the entry of oxygen during inspiration, and the release of carbon dioxide during expiration.

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This increase in understanding is also reflected in the students' ability to relate the lung model to the actual function of the organ in the human body. During the discussion, students actively explained how the movement of the large balloon (which functions as a diaphragm) affects the small balloon (which represents the lungs). They used the terms they had learned such as "inspiration", "expiration", and "air entering the lungs" quite accurately. This shows that through direct experience and concrete visualization, student more easy absorb information And save it in long term memory.

Data from teacher observations show that method experiment project-based also significantly increases students' learning motivation. Students appear more active, cheerful, And enthusiastic in follow learning. They No just sit and listen to the teacher's explanation, but also get involved physically and emotionally in activity Study. Enthusiasm This become indicator important that the learning method used is in accordance with the characteristics of elementary school students who prefer active and fun learning. The teacher also noted that students tend to ask more questions and want to know more about the respiratory system after the experimental activity is completed.

The implementation of project-based experiments also has an impact on development skills scientific student. Through activity This, student trained to observe, make hypotheses, conduct experiments, and draw conclusions from results observation. Activity This No only add outlook students about lungs, but Also grow flavor want to know And attitude scientific Which positive. Some students even suggested further ideas, such as wanting to create a model digestive system or blood circulation with simple materials. This proves that experimental-based learning can stimulate creativity and the spirit of independent learning (Pohan, 2020) .

In its implementation, teachers also play a very important role as facilitators. Teachers must be able to manage the class, guide the experimental process, and ensure that all students are actively involved. The patience and insight of teachers in providing direction and motivation greatly determine the success of this experimental activity. Based on the results of interviews with class V teachers of SDN 188 Pekanbaru, he stated that this approach is very effective in building understanding of science concepts, especially on abstract topics. Teachers also feel helped by the existence of models that can clarify the material and make it easier for students to understand.

From results Which obtained, can concluded that implementation based experiment project in learning system breathing give impact broad And deep, No only on aspect cognitive, but Also on aspect affective and psychomotor skills of students. Increased understanding of concepts, learning motivation, scientific skills, and teamwork indicate that this method is very suitable applied on learning Science in level school base. By Because Therefore, this approach is worth developing. further as part of an innovative, student-centered learning strategy.

C. Challenges and Solutions in Implementing Project-Based Experiments in

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Grade V Elementary School

Although experiment based on project proven effective in improve students' understanding of how the lungs work, its implementation in the classroom also faces several challenges that need to be considered. One of the main challenges is the limited tools and materials available at school. Some groups of students have difficulty because the balloons used are not elastic , the straws are loose or the bottles are not strong enough to withstand the air pressure. This results in the lung model not working properly. Teachers need to take the initiative prepare tool backup or do simulation repeat in a way demonstrative If there was a problem technical Which No can be overcome by students (Sari) et al., 2024) .

In addition, time management is also a challenge. Experimental activities take longer than the usual lecture method. The time available in one meeting is often not enough to complete the entire series of activities from modeling, observation, discussion, to evaluation. To overcome this, teachers can divide activities into two meetings or utilize time outside of class hours such as extracurricular activities. Effective time management will help ensure that all stages of learning are carried out properly without rushing.

The next challenge is the difference in level of understanding and skills between students in one class. Not all students have the same fine motor skills or creativity in assembling models. Some students seem to have difficulty following instructions or are not active in their groups. Condition This need approach differentiation from Teacher, in where faster students can be given additional responsibilities to help their friends. Teachers can also monitor less active groups by providing more intensive direction so that all students remain involved and gain benefits from the activity (Putranto, 2015) .

Another challenge that emerged was class management during experimental activities. ongoing. The nature of the activity is active And involving Lots Movement often makes the classroom atmosphere noisy. If not managed properly, this situation can disrupt students' concentration and focus. To overcome this, teachers need to set clear rules before the activity begins, such as a sound limit. Which allowed, time workmanship, And method convey results discussion. The role of the teacher as a regulator of class dynamics is very important so that experimental activities continue to run smoothly and orderly.

In terms of evaluation, teachers also need to adjust the assessment instruments to the project-based learning approach. Assessment does not only focus on results end in the form of model lungs, but Also must consider the process that students go through, individual involvement in groups, and their ability to explain the results of observations. Holistic assessment will provide a more comprehensive picture of student learning achievement, both from cognitive, affective, and psychomotor aspects. Teachers can use assessment rubrics that include criteria such as creativity, model accuracy, teamwork, and mastery of the material.

Solutions to these various challenges can be done through planning. Which ripe, training Teacher, as well as support from party school. Teachers need to design activity experiment far away day, including prepare tools and material reserve, as well as to design

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channel activity Which realistic in accordance time available. Teacher training on project-based learning is also important so that teachers own understanding And skills Which adequate in manage classes and facilitate learning activities effectively. Support from the principal in the form of providing tools, flexible time policies, and strengthening the curriculum is needed so that this approach can run optimally (Salirawati, 2018) .

Overall, although there are a number of challenges in implementing experiment based on project in class V SD, However with strategy right, challenge the can overcome. Precisely through process face this is the challenge Teacher And student can develop together in atmosphere Study Which active, fun, And meaningful. Approach learning like This in line with spirit curriculum independent Study Which put student as subject active in process Study. With thus, learning Science become more life and relevant to students' daily lives.

4. CONCLUSION

Based on the analysis that has been carried out, it can be concluded that the use of a project-based experimental approach in learning the respiratory system, especially in the material on how the lungs work, provides a significant contribution to the understanding of fifth grade students at SDN 188 Pekanbaru. Learning Which started from introduction draft, to be continued with making a lung model, as well as observation and discussion, successfully built a concrete and comprehensive understanding in students. They not only understand the function of the lungs in theory, but can also observe and explain the process of inspiration and expiration through models made by their own hands.

In addition to improving cognitive understanding, this approach also develops students' affective and psychomotor aspects. Students become more motivated to learn, more active in participating in discussions, and are able to work together in groups. Challenges that arise such as limited tools, differences in student abilities, and classroom management can be overcome through planning Which ripe, role Teacher as facilitator Which active, and support from the school. Therefore, project-based experiments are highly recommended to be applied more widely in science learning. in school base as part from innovation learning Which centered to students.

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