Implementation of Project-Based Learning Model in Integrated Science Learning to Improve Science Literacy Aspects

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Abstract: This research aims to improve aspects of science literacy by implementing the project-based learning model in integrated science learning for class VIII students at SMP N 1 Soa. Therefore, Classroom Action Research (CAR) was employed in two cycles: planning, implementation, observation, and reflection. The research results show that through the project-based learning model, the percentage in the context aspect in Cycle I was 48.27% with sufficient criteria, while in Cycle II, the percentage was 68.96% in the good category and experienced an increase of 20.69%. The percentage of content aspects in Cycle I was 55.17% with good criteria, while in Cycle II, the percentage was 72.41% in the good category and experienced an increase of 17.24%. The percentage of process aspects in Cycle I was 27.58% with good criteria, while in Cycle II, the percentage was 51.72% in the good category and experienced an increase of 24.14%. Based on the research results, a project-based learning model application helps the students improve science literacy. They become more active and able to work together well in groups by increasing their motivation to learn and their skills in solving problems. With creativity, a project-based learning model application can help in training students to solve problems from various points of view.

Abstrak: Penelitian ini bertujuan untuk meningkatkan aspek literasi sains dengan menerapkan model project-based learning dalam pembelajaran IPA terpadu pada siswa kelas VIII SMP N 1 Soa. Oleh karena itu, Penelitian Tindakan Kelas (PTK) ini dilaksanakan dalam dua siklus, setiap siklus meliputi tahap perencanaan, pelaksanaan, observasi dan refleksi. Hasil penelitian menunjukkan bahwa melalui model project-based learning persentase aspek konteks pada siklus I sebesar 48,27% dengan kriteria cukup, sedangkan pada siklus II persentasenya sebesar 68,96% dengan kategori baik dan mengalami peningkatan sebesar 20,69%. Persentase aspek isi pada siklus I sebesar 55,17% dengan kriteria baik, sedangkan pada siklus II persentasenya sebesar 72,41% dengan kategori baik dan mengalami peningkatan sebesar 17,24%. Persentase aspek proses pada siklus I sebesar 27,58% dengan kriteria baik, sedangkan pada siklus II persentasenya sebesar 51,72% dengan kategori baik dan mengalami peningkatan sebesar 24,14%. Berdasarkan hasil penelitian, penerapan model pembelajaran berbasis proyek membantu siswa dalam meningkatkan aspek literasi sains. Mereka menjadi lebih aktif dan mampu bekerja sama dengan baik dalam kelompok dengan meningkatkan motivasi belajar dan keterampilan dalam memecahkan masalah. Dengan kreativitas, penerapan model pembelajaran berbasis proyek dapat membantu dalam melatih siswa memecahkan masalah dari berbagai sudut pandang.

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A. Introduction

In the twenty-first century, the quality of education is critical to a country's existence. Training and teaching significantly impact a country's mentality, character, and conduct (Inanna, 2018). Developing students' potential is a critical aspect of education, as it equips them with the knowledge and skills necessary to effectively harness and apply that potential in their forthcoming endeavors (Husain, 2019). The learning process can currently incorporate knowledge, literacy skills, attitudes, and technological mastery. As opposed to literacy, which involves writing and reading, science literacy entails the practical application of knowledge and competencies in one's daily life.

Science literacy is the ability to use scientific knowledge to acquire new knowledge and explain learning activities by drawing conclusions based on facts (Fuadi et al., 2020). Science literacy is critical in science education because it stimulates students' cognitive abilities and broadens their understanding of scientific concepts. Knowledge of scientific principles and their practical applications, scientific knowledge, and the capacity to think scientifically are all components of science literacy (Abidin et al., 2021). It can be replaced with student handbooks to increase students' science literacy with technological advances (Khoiriah & Kholiq, 2020).

According to PISA (2022), science literacy is students' ability to understand science-related issues with scientific thinking as intelligent citizens. Achieving science literacy is a goal in learning, particularly in science (Winata et al., 2016). There are three aspects of science literacy: 1) science content; 2) science process; and 3) science context. Science content pertains to concepts that anticipate alterations brought about by human actions. The scientific process entails obtaining information from the given questions and equipping it with concrete evidence. The context of science includes areas of individual and social application of science, which include the welfare of natural resources, climate, and scientific progress (Pertiwi et al., 2018).

Science encompasses all aspects of the natural world and its surroundings. Science education aims to acquire knowledge and comprehension of science in a wider framework that encompasses its principles and operations, particularly as they pertain to daily life (Fatmala et al., 2017). Science education, one aspect of science literacy, must foster students' self-assurance, encourage them to learn about science and equip them with the attitudes and abilities necessary to apply their knowledge (Rini et al., 2021). In order to comprehend science education, one must possess science process skills, thinking skills, and science literacy-oriented skills (Fitariya, 2018).

Scientific knowledge plays a critical role in junior high school education as it prepares students to confront the challenges of the twenty-first century. For this reason, it is critical to implement a teaching strategy that equips students with the knowledge and skills necessary to master technology, think critically and creatively, express their opinions accurately, and collaborate effectively. Such preparation should instill in students a strong sense of accountability when confronted with difficult decisions (Lawe, 2018). Science literacy enables students to comprehend and articulate scientific concepts orally and in

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writing, and resolve issues; as a result, they develop a heightened awareness and concern for themselves and their surroundings when it comes to making scientifically informed decisions (Ulfa et al., 2017)

However, the low level of science literacy is a problem that needs to be addressed. According to Huryah et al (2017), on average, students' science abilities only reach the ability to remember and recognize simple facts. However, they still need to be able to communicate, relate, and apply abstract concepts in everyday life. This condition requires efforts to improve science learning in schools gradually and continuously in order to increase students' science literacy (Hartati, 2016). Student character values are also very important in student development (Dinata, 2018). This can help students develop more creative thinking patterns.

Observations and interviews with science subject teachers at SMP N 1 Soa revealed minimal science literacy among students. The students' low science literacy score of only 30% and their failure to meet the school's established KKM serve as evidence of this. Several factors influence the absence of science literacy in learning, one of which is the teachers' failure to employ diverse learning models. Teachers tend to use the lecture method, where many learning activities involve a more active teacher role, so students are less active in learning. This approach also diminishes the interest in learning, as it fails to spark student engagement and makes science lessons appear dull, leading to a decrease in problem-solving skills and a need for more proficiency in learning. Therefore, an appropriate learning model is needed in order to improve aspects of students' science literacy.

To overcome this problem, a project-based learning model where learning is student-centered is proposed. Based on the outcomes of project-based products, we can utilize this model to address issues in the learning process (Nababan et al., 2023). Students begin by delving deeper into a topic in a manner that is truly relevant to their work. The project-based learning model is a learning model that provides students with the opportunity to solve problems in real life, identify the causes of problems, and solve the problems together. Students are also able to gain knowledge and understanding based on new experiences regarding the learning that students participate in (Anita, 2017).

The project-based learning model aims to ensure that students can carry out tasks given by the teacher and produce products made by students. Students are involved in solving problems in learning, and we provide opportunities for them to work together so that they can produce a real product with realistic value (Tinenti, 2018). The project-based learning model can make students more active, creative, and innovative in solving problems to increase their literacy. Thus, the t-based learning model must be applied in classroom learning to improve science literacy.

B. Method

This research was conducted at SMP N 1 Soa, Wolomeze District, Ngada Regency, East Nusa Tenggara Province. All 29 students in class VIII were the subjects of this research.

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Meanwhile, the object of this research was the science literacy aspect through the application of the project-based learning model at SMP N 1 Soa.

This study used the Classroom Action Research (CAR) method because it occurred in a classroom or during the teaching and learning process (Djajadi, 2019). Three words comprise the CAR: research, action, and class. This research was defined as the process of closely examining an object using methodological rules to gather data to enhance the quality of something of interest to the researcher; the action was defined as a purposeful, cycle-like activity; and the class was defined as a group of students who, over a specific period, shared the same lessons from a teacher. Atmono (2009) states that the CAR design employs Kemmis and McTaggart's CAR model, which follows a flow from planning (plan), executing actions (act), making observations (observer), and reflecting (reflection), as illustrated in Figure 1.

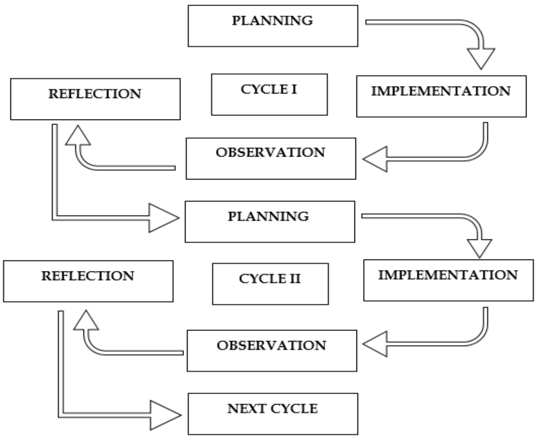

Figure 1. Classroom Action Research Cycle

This study was conducted over two cycles. The tests were used to collect data for science literacy aspects. The test given was in the form of science literacy questions consisting of questions for the context aspect, content aspect, and process aspect. After collecting data, the next step was managing the data using statistical equations. Equations were used to determine increased aspects of students' science literacy through the project-based learning model. Arikunto (2007) discovered the following formula equation to evaluate percentages in research:

$$\text{Percentage} = \frac{Number\ of\ students\ who\ answered\ correctly}{Total\ number\ of\ students}\ 100\%$$

The success level criteria are as follows:

75%<NR≤100% = Very good
50%<NR≤75% = Good
25%<NR≤50% = Less good
0%< NR≤25% = Not Good

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C. Result and Discussion

Results

Description of Classroom Action Research (CAR) in Cycle I

Learning activities in Cycle I to improve aspects of science literacy by implementing project-based learning consist of four stages: 1) Planning stage. At this stage, the learning action plan in Cycle I is preparing teaching modules according to the material to be taught, preparing student worksheets, and preparing evaluation questions to determine the increase in aspects of science literacy. 2) Implementation Stage. In the implementation phase of Cycle I, one face-to-face meeting was held on October 9, 2023, at SMP N 1 Soa. Learning activities are referred to as teaching modules. The learning activities refer to teaching modules that have been prepared, and then students are divided into groups. At the beginning of the lesson, the teacher conveys the learning objectives and continues by explaining the material, then distributing student worksheets to each group for discussion. During the discussion process, the teacher directs it. After the discussion, each group presented the results, and other groups responded. At the end of the lesson, the teacher provides conclusions from the material that has been taught. 3) Observation stage. This stage involves observing student activity in the classroom during the learning process. The teacher administers pre-test evaluation questions to gauge the students' literacy skills based on the provided indicators of science literacy. The results of evaluations show students' science literacy in context, content, and process. The material for the respiratory system is presented in Table 1.

Table 1. Data on Science Literacy Aspects in Cycle I

Aspects of Science Literacy	Indicator	Number of Students Who Answered Correctly	Percentage	Criteria
Context	Presenting the learning materials on the human respiratory system	14	48,27%	Less good
Content	Explaining the learning materials on respiratory system disorders.	16	55,17%	Good
Process	Discussing, presenting, and evaluating	8	27,58%	Less good

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From the data above, the following diagram is illustrated in Figure 2:

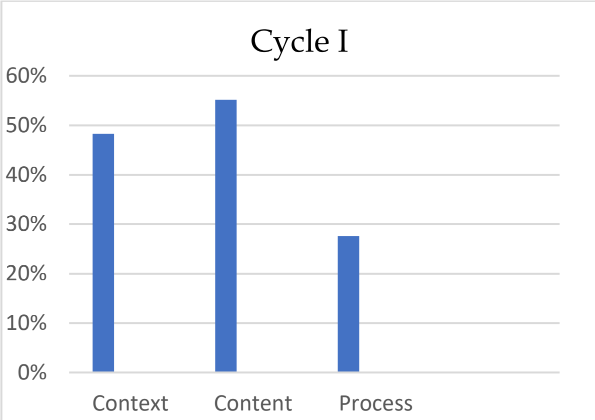

Figure 2. Data on Cycle I of Science Literacy Aspects

Based on the table and diagram data above, the science literacy aspect of the Cycle in the context aspect of Cycle I was 48.27% with sufficient criteria; in the content aspect of Cycle I, the percentage was 55.17% with good criteria; in the content aspect of Cycle I, the percentage was 55.17% with good criteria; and in the process aspect of Cycle I, the percentage was 27.58% with good criteria. 4) Reflection stage. Based on the data presented in the table above, several issues are identified: 1) the teachers do not relate the material taught to concepts that occur in everyday life; 2) the students feel bored and tend to be passive in responding to the material taught by the teacher; 3) the students tend to be passive in solving problems, identifying, presenting, and drawing conclusions. Based on the results of the reflection above, some aspects need to be improved, such as 1) explaining the material by linking the material taught through concepts that occur in everyday life; 2) explaining the material by providing content and creating a project; and 3) providing opportunities for students to be more active in solving problems, identifying, presenting, and drawing conclusions. For this reason, there is a need for further action to address the deficiencies mentioned above by carrying out learning in Cycle I. The Learning Activities in Cycle I are illustrated in Figure 3.

Figure 3. Learning Activities in Cycle I

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Description of Classroom Action Research (CAR) in Cycle II

The learning activities in Cycle II, which aim to enhance aspects of science literacy through implementing project-based learning, consist of four stages: 1) Planning stage. At this stage, learning activities emphasize improvements in learning from the results of reflection in Cycle I. Cycle I is a learning action plan that involves preparing teaching modules based on the material to teach, creating student worksheets, and formulating evaluation questions to identify areas for improvement. science literacy. 2) Implementation Stage. On November 8, 2023, at SMP N 1 Soa, a face-to-face meeting occurred during the Cycle I implementation phase. Learning activities are referred to as teaching modules. The learning activities are prepared teaching modules, and we divide the students into groups. At the start of the lesson, the teacher communicates the learning objectives and poses thought-provoking questions, enabling students to connect the taught material to everyday life concepts. Before the teacher divides students into several groups, the teacher presents content in videos so that students do not feel bored. Then, the teacher will explain the material and divide the students into several groups. Once the teacher divides the students into groups, she guides them in designing a practicum-style project that explores the health risks associated with smoking. The teacher asks students to complete their projects in groups and sets a time for completion. The teacher guides students in working on the project by visiting each group, providing guidance, and monitoring their activities as they complete the project. After the discussion, each group presented their product, and the other groups responded. The teacher draws conclusions from the material at the lesson's end. 3) Observation stage. This stage involves observing student activity in the classroom during the learning process. The teacher administers evaluation questions in the form of a post-test to gauge the students' literacy skills based on the provided indicators of science literacy. Aspects of science literacy possessed by students can be seen from the results of evaluations carried out by students, which are observed in aspects of context, content, and process. Student scores in Cycle I of the respiratory system material are presented in Table 2.

Table 2. Data on Aspects of Science Literacy in Cycle II

Aspects of Science Literacy	Indicator	Number of Students Who Answered Correctly	Percentage	Criteria
Context	Presenting the learning materials on the human respiratory system	20	68,96%	Good
Content	Explaining the learning materials on respiratory system disorders	21	72,41%	Good
Process	Designing, identifying, discussing, presenting, and evaluating	15	51,72%	Good

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From the data above, the following diagram is illustrated in Figure 4:

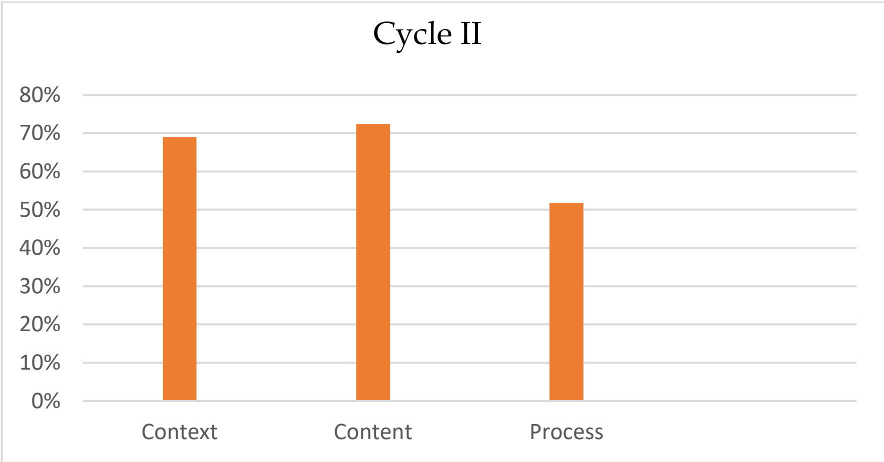

Figure 4. Data on Aspects of Science Literacy in Cycle II

According to the table and diagram data above, the science literacy aspect in Cycle II was 68.96% in the good category, 72.41% in the good category, and 51.72% in the good category. 4) Reflection stage. Based on the data obtained above, we can say that the Reflection stage is beneficial because 1) the students can relate the material concepts they are taught to concepts that occur in everyday life; 2) working on the assigned projects encourages students to become more active; 3) learning is student-focused, where the students become more active in solving problems and are enthusiastic about working together to complete the projects they are working on. The Learning Activities in Cycle II are illustrated in Figure 5.

Figure 5. Learning Activities in Cycle II

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Based on the research results above, a more detailed discussion was carried out regarding improving aspects of students' science literacy through project-based learning. Data on increasing aspects of science literacy in Cycle I and II are in Table 3.

Table 3. Data on Increasing Aspects of Science Literacy in Cycle I and Cycle II

Aspects of Science Literacy	Percentage of Cycle I (Criteria)	Percentage of Cycle II (Criteria)	Increase Percentage
Context	48,27% (Less good)	68,96% (Good)	20,69%
Content	55,17% (Good)	72,41% (Good)	17, 24%
Process	27,58% (Less good)	51,72% (Good)	17, 24%

From the data above, the following diagram is illustrated in Figure 6:

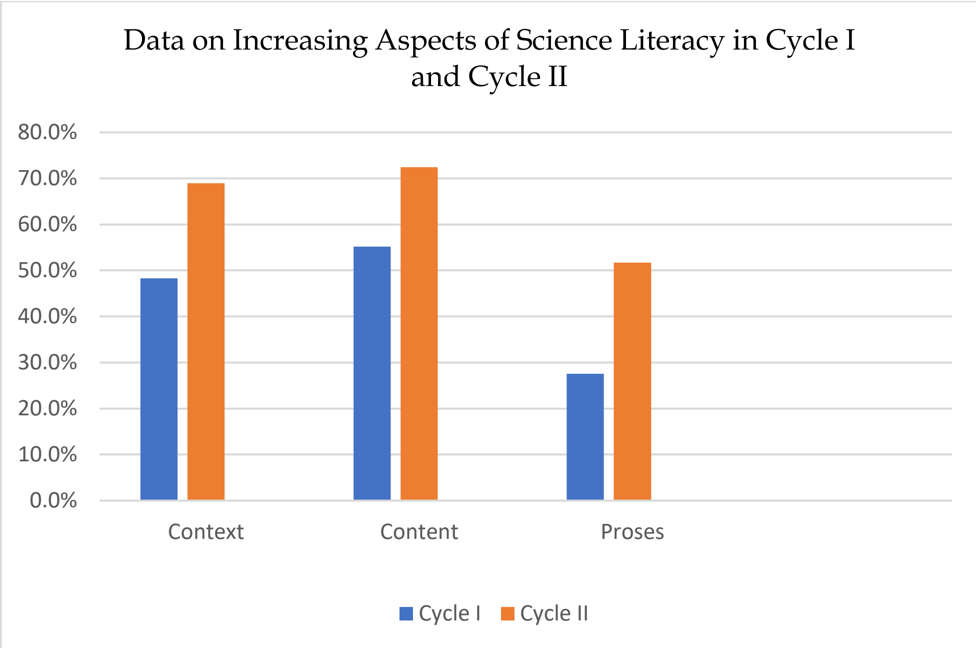

Figure 6. Data on Increasing Aspects of Science Literacy in Cycle I and Cycle II

Based on the table and diagram data above, the science literacy aspect in cycles I and II experienced an increase in the context aspect in Cycle I, amounting to 48.27% with sufficient criteria. In comparison, in Cycle II, the percentage was 68.96% with the good category and experienced an increase of 20.69%. Through project-based learning, the percentage in the content aspect in Cycle I was 55.17% with good criteria, while in Cycle II, the percentage was 72.41% in the good category and experienced an increase of 17.24%. Through project-based learning, the percentage in the process aspect in Cycle I was 27.58% with good criteria, while in Cycle II, the percentage was 51.72% in the good category and experienced an increase of 24.14%.

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Discussion

In the context aspect, Table 3 reveals that 14 students correctly answered the context aspect of Cycle I, with a percentage of 48.27% meeting the necessary criteria. In Cycle I, when students learn about the human respiratory system through indicators, the teacher presents the material but needs to connect it to everyday concepts. This significantly impacts students, who still struggle to integrate the material into their daily lives. The students' answers indicate that they still contain theory and have yet to apply material concepts to solve the questions. This is due to a need for more understanding of scientific concepts in everyday life (Nofiana, 2017). Therefore, it is necessary to reflect on and plan improvements for cycle II. What is done is to apply a project-based learning model through student worksheets. Therefore, the student project results provide a deeper understanding of the concept of breathing within the context of human life.

Meanwhile, in Cycle II, the percentage of context aspects was 68.96% with good criteria, an increase of 20.69%. This percentage increase was produced after reflecting on providing project-based learning connected to everyday life. This is in line with Okada (2013), who stated that literacy is the ability to read and relate it to everyday life. The students' low science literacy is because they do not yet link scientific concepts with everyday life (Nadhifatuzzahro et al., 2015)

Table 3 shows that in Cycle I is a content aspect, 16 students answered the questions correctly, with a percentage of 55.17% in the good category. During the first learning cycle, where the teacher uses indicators to explain respiratory system disorders, students typically respond passively to the material. Therefore, Cycle II improvement plans undergo reflection through project-based learning, which involves elucidating the subject matter through video content and project creation (Supardi et al., 2015). The content effect is related to the material taught and the video project, which presents disorders that occur in the respiratory system. The dangers of smoking can harm human health, especially the human respiratory system, so this project can make it easier for students to understand the concept of the respiratory system so that students do not feel bored. In Cycle II of the content aspect, the % of students with good criteria was 72.41%, so the content aspect increased by 17.24%. This is in line with research conducted by Sakti et al (2021), which stated that increasing student literacy with the project-based learning model.

Table 3 illustrates the process aspect, revealing that in Cycle I, 8 students accurately responded to the questions, indicating that 27.58% met the necessary criteria. During the first learning cycle, the teacher primarily explained the material. According to the learning outcomes, students tend to be passive in solving problems, identifying, presenting, and drawing conclusions. The material only provides theoretical explanations, making it difficult for students to understand. This is material for reflection on improvement in Cycle II with the indicators of designing, identifying, discussing, presenting, and evaluating. In Cycle II, the project aimed to address this issue by developing a basic practicum focused on smoking-related risks. The goal is for students to solve problems, demonstrate active participation, collaborate effectively, and draw conclusions from their solutions. The

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percentage of students who demonstrate good process aspects stands at 51.72%, indicating a significant increase of 24.14%. There is a lack of process aspects because students still perceive themselves as individuals who have yet to reach the level of literate humans (Nurgiyantoro et al., 2020).

Using project-based learning, students can carry out the tasks and produce a product. Satrianawati & Hidayah (2017) stated that the project-based learning model offers numerous benefits, including (1) its applicability across nearly all educational domains, (2) its ability to adapt to real-world situations and facilitate learning by integrating the information with students' existing knowledge; (3) Useful student learning processes and skills in collecting and analyzing data; (4) Students are responsible for themselves for what they learn so that they can increase self-motivation; (5) the learning process which encourages students to use abilities, namely abilities in communication and presentation; (6) encouraging students to think critically and master evidence; (7) developing models of knowledge about the subject; (8) project-based learning to improve learning in groups or teams.

Afriana et al (2016) stated that using the project-based learning model can influence the learning process because it has several functions, such as correctly, concretely, and realistically instilling basic concepts. Students can enhance their understanding of learning by being motivated through media or projects. Project-based learning is a learning model involving students carrying out an activity or project to produce a product. According to Sakti et al (2021), The implementation stages or steps are as follows: a) determining the strategies with the essential questions; b) designing a plan for the project; c) preparing and creating a schedule.

The project-based learning model has the main objective, namely, to train students to collaborate, work together, and sympathize with each other. This is my opinion. Anggraini & Wulandari (2020) stated that project-based learning aims to provide students with broad insight when facing problems directly, developing skills and expertise in thinking about the problems they will face. So, applying this model aims to sharpen and instill in students the habit of thinking critically when dealing with problems they receive. In addition, students can use this model to enhance their understanding.

D. Conclusion

The research results indicate that project-based learning can enhance student literacy in context, content, and process. Students demonstrate this by gaining more value with each Cycle. Implementing the project-based learning model delivers science learning in theory and encourages students to think creatively and collaborate to complete the assigned project. Implementing the project-based learning model aligns effectively with the chosen learning indicators. The project-based learning model allows students to be more active in providing ideas through the projects they produce.

According to the research results, the project-based learning model significantly aids students in enhancing their science literacy. Teachers can select and identify the appropriate

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project to foster students' creative thinking skills, enabling them to meet their learning objectives, boost their learning motivation, and foster group collaboration. This approach encourages students to participate more actively by offering innovative ideas and practical solutions to problems, resulting in more diverse and captivating work. With creativity, students can train students to solve problems from various points of view.

Based on the research above, we need to implement the following recommendations to enhance the quality of science literacy: Students are expected to further improve their abilities in aspects of science literacy, especially in the context, content, and process of learning. Teachers should use varied learning models and master theory, models, and steps in learning so that the learning process can run smoothly. We expect future researchers to apply the project-based learning model to various science materials. So, you can increase the science literacy aspect of science learning and create innovative projects to increase students' dents science

References

Abidin, Y., Mulyati, T., & Yunansyah, H. (2021). *Pembelajaran Literasi: Strategi Meningkatkan Kemampuan Literasi Matematika, Sains, Membaca, dan Menulis*. Jakarta: Bumi Aksara

Afriana, J., Permanasari, A., & Fitriani, A. (2016). Penerapan Project Based Learning Terintegrasi STEM untuk Meningkatkan Literasi Sains Siswa Ditinjau dari Gender. *Jurnal Inovasi Pendidikan IPA, 2*(2), 202-212. https://doi.org/10.21831/jipi.v2i2.8561

Anggraini, P. D., & Wulandari, S. S. (2021). Analisis Penggunaan Model Pembelajaran Project Based Learning Dalam Peningkatan Keaktifan Siswa. *Jurnal Pendidikan Administrasi Perkantoran (JPAP), 9*(2), 292-299. https://doi.org/10.26740/jpap.v9n2.p292-299

Anita, I. W. (2017). Implementasi Pembelajaran Berbasis Proyek untuk Menumbuhkan Kemampuan Berpikir Kreatif Matematis Mahasiswa. *Jurnal Penelitian dan Pembelajaran Matematika, 10(*1), 125–131. https://doi.org/10.30870/jppm.v10i1.1287

Arikunto, S. (2007). *Penelitian Tindakan Kelas*. Jakarta: Bumi Aksara.

Atmono, D. (2009). *Hubungan Kepedulian Guru terhadap Inovasi, Budaya Sekolah, dan Kompetensi Profesional dengan Keefektifan Sekolah pada Sekolah Dasar Negeri di Kota Banjarmasin*. Doctoral dissertation. Malang: Universitas Negeri Malang.

Dinata, N. M. (2018). Nilai-Nilai Karakter dalam Pembelajaran IPA di Perguruan Tinggi. *Jurnal Ilmiah Pendidikan Citra Bakti*, 177–187.

Djajadi, M. (2019). *Penelitian Tindakan Kelas (Classroom Action Research)*. Yogyakarta: Arti Bumi Intaran.

Fatmala, S. A., Sujana, A., & Maulana, M. (2017). Pembelajaran Kontekstual untuk Meningkatkan Literasi Sains Siswa SD Kelas V pada Materi Peristiwa Alam. *Jurnal Pena Ilmiah, 2*(1), 211-220. https://doi.org/10.17509/jpi.v2i1.10656

Fitariya, F. (2018). *Meningkatkan Literasi Sains di SDN Sidokumpul dengan Metode Exsperimen.* PTK A3 PGSD FKIP Universitas Muhammadiyah Sidoarjo.

Fuadi, H., Robbia, A. Z., Jamaluddin, J., and Jufri, A. W. (2020). Analisis Faktor Penyebab Rendahnya Kemampuan Literasi Sains Peserta Didik. *Jurnal Ilmiah Profesi Pendidikan, 5*(2), 108–116. https://doi.org/10.29303/jipp.v5i2.122

Hartati, R. (2016). Peningkatan Aspek Sikap Literasi Sains Siswa SMP melalui Penerapan Model Problem Based Learning pada Pembelajaran IPA Terpadu. *Edusains, 8*(1), 90–97. https://doi.org/10.15408/es.v8i1.1796

Huryah, F., Sumarmin, R., & Effendi, J. (2017). Analisis Capaian Literasi Sains Biologi Siswa SMA Kelas X Sekota Padang. *Jurnal Eksakta Pendidikan (JEP), 1*(2), 72-79. https://doi.org/10.24036/jep.v1i2.70

Husain, A. P. (2019). Analisis Strategi Pembelajaran IPA dalam Buku Tematik Kurikulum 2013 Kelas IV SD. *As-Salam: Jurnal Studi Hukum Islam & Pendidikan, 8*(1), 125-150. https://doi.org/10.51226/assalam.v8i1.158

Inanna, I. (2018). Peran Pendidikan dalam Membangun Karakter Bangsa yang Bermoral. *JEKPEND" Jurnal Ekonomi dan Pendidikan", 1*(1), 27-33.

Khoiriah, M., and Kholiq, A. (2020). Validitas Perangkat Pembelajaran Fisika Berbantuan E-Book Literasi Sains pada Materi Fluida Dinamis. *Jurnal Inovasi Pendidikan Fisika (JIPF), 09*(01), 779–783.

Lawe, Y. U. (2018). Pengaruh Model Pembelajaran Berbasis terhadap Hasil Belajar IPA Siswa SD. *Journal of Education Technology, 2*, 1–9.

Nababan, D., Marpaung, A. K., & Koresy, A. (2023). Strategi Pembelajaran Project Based Learning (Pjbl). *Jurnal Pendidikan Sosial dan Humaniora, 2*(2), 706-719.

Nadhifatuzzahro, D., Setiawan, B., & Sudibyo, E. (2015). Kemampuan Literasi Sains Siswa Kelas VII-B SMP Negeri 1 Sumobito Melalui Pembuatan Jamu Tradisional. In *Seminar Nasional Fisika Dan Pembelajaran*, 22–27.

Nofiana, M. (2017). Profil Kemampuan Literasi Sains Siswa SMP di Kota Purwokerto Ditinjau dari Aspek Konten, Proses, dan Konteks Sains. *JSSH (Jurnal Sains Sosial dan Humaniora), 1*(2), 77-84. https://doi.org/10.30595/jssh.v1i2.1682

Nurgiyantoro, B., Lestyarini, B., & Rahayu, D. H. (2020). Mapping Junior High School Students' Functional Literacy Competence. *Cakrawala Pendidikan, 39*(3), 560–572. https://doi.org/10.21831/cp.v39i3.34061

Okada, A. (2013). Scientific Literacy in the Digital Age: Tools, Environments and Resources for Co-Inquiry. *European Scientific Journal, 4*, 263-274.

Pertiwi, U. D., Atanti, R. D., & Ismawati, R. (2018). Pentingnya Literasi Sains pada Pembelajaran IPA SMP Abad 21. *Indonesian Journal of Natural Science Education (IJNSE), 1*(1), 24–29.

Rini, C. P., Hartantri, S. D., & Amaliyah, A. (2021). Analisis Kemampuan Literasi Sains pada Aspek Kompetensi Mahasiswa PGSD FKIP Universitas Muhammadiyah Tangerang. *Jurnal Pendidikan Dasar Nusantara, 6*(2), 166-179. https://doi.org/10.29407/jpdn.v6i2.15320

Sakti, I., Nirwana, N., & Swistoro, E. (2021). Penerapan Model Project-Based Learning untuk Meningkatkan Literasi Sains Mahasiswa Pendidikan IPA. *Jurnal Kumparan Fisika, 4*(1), 35–42. https://doi.org/10.33369/jkf.4.1.35-42

Satrianawati, & Hidayah, N. (2017). *Model Pembelajaran untuk Keterampilan Abad 21.* Yogyakarta: Depublish.

Supardi, S. U. S., Leonard, L., Suhendri, H., & Rismurdiyati, R. (2015). Pengaruh Media Pembelajaran dan Minat Belajar terhadap Hasil Belajar Fisika. *Formatif: Jurnal Ilmiah Pendidikan MIPA, 2*(1), 71–81. https://doi.org/10.30998/formatif.v2i1.86

Tinenti, Y. R. (2018). *Model Pembelajaran Berbasis Proyek (PBP) dan Penerapannya dalam Proses Pembelajaran di Kelas*. Yogyakarta: Depublish.

Ulfa, U., Saptaningrum, E., & Kurniawan, A. F. (2017). Pengaruh Model Discovery Learning pada Mata Pelajaran IPA Terpadu terhadap Penguasaan Literasi Sains Siswa. In *Prosiding SNFA (Seminar Nasional Fisika dan Aplikasinya), 2,* 257-268. https://doi.org/10.20961/prosidingsnfa.v2i0.16408

Winata, A., Cacik, S., & RW, I. (2018). Analisis Kemampuan Awal Literasi Sains Mahasiswa pada Konsep IPA. *Education and Human Development Journal, 1*(1), 40–47.