



Integrated Paired Literacy Model Problem-Based Learning to Improve Biology Learning Outcomes

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Article Information	ABSTRAK
Submitted: 31 – 07 – 2023 Accepted: 28 – 09 – 2023 Published: 29 – 09 – 2023	Implementasi pada pembelajaran PBL dapat meningkatkan kemampuan literasi peserta didik karena dalam aktivitas pembelajarannya menuntut peserta didik untuk aktif berliterasi untuk menemukan solusi atas sebuah permasalahan yang diberikan. Kemampuan berliterasi kesehatan sangat penting dimiliki oleh peserta didik dalam pembelajaran biologi, melalui kemampuan tersebut peserta didik dapat meningkatkan hasil belajarnya. Kemampuan literasi untuk menunjang hasil belajar peserta didik, didukung dengan penerapan teknik literasi berpasangan. Melalui metode Penelitian Tindakan Kelas (PTK) dengan model penelitian bersiklus selama 5 minggu, diharapkan mampu meningkatkan hasil belajar peserta didik kelas XI MIPA. Pengumpulan data dilakukan dengan teknik tes dengan jenis data kuantitatif. Sehingga dapat disimpulkan aktivitas literasi berpasangan pada model PBL dapat membantu peningkatan hasil belajar pada materi sistem reproduksi peserta didik kelas XI MIPA 2 dengan persentase ketuntasan klasikal 61.11%. Kata kunci: Hasil Belajar; Literasi Berpasangan; PBL.
Publisher	ABSTRACT
Program Studi Pendidikan Biologi, Fakultas Sains dan Teknologi, UIN Walisongo Semarang	<i>The application of PBL learning can improve students' literacy skills because the learning activities require students to actively engage in literacy to find solutions to a given problem. Literacy skills are very important for students to have in learning biology; through these skills, students can improve their learning outcomes. Health literacy skills to support student learning outcomes are supported by the application of paired literacy techniques. Through the Classroom Action Research (CAR) method with a cyclical research model over 5 weeks, it is expected to be able to improve the learning outcomes of class XI Science. Data collection was carried out by testing techniques with quantitative data types. Therefore, it can be concluded that paired literacy activities in the PBL model can improve biology learning outcomes in the reproductive system material of class XI Science students with a classical completion percentage of 61.11%.</i> Keywords: Learning Outcomes; PB; Pair Literacy.

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INTRODUCTION

A system with the primary goal of changing an individual's attitudes and behaviors by providing education and training to shape mature individuals is at the core of education. Therefore, education is required to remain dynamic in the evolving times (Candrakusuma, 2020). Skills and abilities in literacy are highly needed in this era of rapid technological advancement. Science and technology are progressing rapidly and significantly in the 21st century, leading to various issues closely tied to science and technology (Doringin et al., 2020). The emerging problems can be addressed by forming students with literacy skills through adaptation in the field of education. Therefore, students are expected to be responsive in finding information through literacy.

Information literacy, health literacy, digital literacy, and scientific literacy skills need to become a habit in the world of education to create highly capable and literate individuals (Redhana, 2019). Literacy skills refer to an individual's ability to search for, discover, and acquire information. Based on this understanding, it can be observed that a person's ability to obtain information influences their intellectual development. The connection between literacy and intellectual development can be utilized to create integrated learning experiences that enhance students' learning outcomes. The improvement of the quality of education is a small step toward initiating an enhancement in the quality of education (Khoiri et al., 2017).

Implementing integrated learning with literacy habits among students can support their intellectual development and learning outcomes. The literacy skills of students in the 21st century are closely related to their ability to interpret information analytically and critically, as well as engage in reflective thinking. However, Indonesia's current education state shows a low interest in reading (Hasan et al., 2022). This issue necessitates a deeper examination concerning students' reading interests and their correlation with biology learning outcomes. Consequently, there is a need to engage in literacy activities within the realm of biology lessons. Implementing the PBL (Problem-Based Learning) model integrated with paired literacy began with a literacy period and literacy journal filling.

Biology develops through observation and experiments, which are part of Natural Sciences (Agustina & Saputra, 2016). The scope of Biology materials studied by eleventh-grade students in the second semester includes the respiratory system, excretory system, regulatory system, NAPZA (Narcotics, Alcohol, Psychotropic Substances, Addictive Substances), reproductive system, and immune system. These topics are always related to human body health. The HLS-EU-10Q-IDN is a short version of the questionnaire developed according to Indonesian conditions so that it is expected to be more effective and efficient in measuring the level of health literacy of Indonesian people. Based on the initial HLS-EU-SQ10-IDN health literacy questionnaire measurement results, which show problematic to sufficient categories, as indicated by the average Health Literacy index scores of eleventh-grade students in class XI Science 2 ranging from 33 to 40, classified as sufficient.

This affects the learning outcomes obtained by students in class XI Science 2 at Ambulu State High School, which also indicates a low level. The average learning outcomes obtained by students of XI Science 2 in the last three chapters have not been able to meet the Minimum Mastery Criteria (KKM) set by the school, which is a score of 75. Student Learning Outcomes for XI Science 2, Second Semester at Ambulu State High School measurement result Excretory System (Average score: 70.28), NAPZA (Average score: 71.17) Regulatory System (average score: 71.39)

Biology lessons is considered as a learning process that actively involves students in scientific work related to natural phenomena, objects, and everyday life issues (Widiyana, 2021). Therefore, biology teachers must be capable of applying various models and teaching strategies. Problem-based learning (PBL) is one of the cooperative learning models that is highly suitable for biology materials and can enhance students' mastery of the subject matter as well as their literacy skills. Lendeon and Poluakan (2022) mentioned in their research that the PBL model can improve literacy skills by emphasizing problem-solving abilities. The essence of the PBL (Problem-Based Learning) model is to present authentic problems that contain meaningful elements for the learners. Learning through the PBL model requires the teacher to act as a provider of problems and questions, as well as to facilitate learners in conducting investigations (Rerung et al., 2017). Implementing the PBL model involves directly engaging learners in the problem-solving process through the stages of the scientific method, which can help learners build knowledge related to the issues being addressed (Utrifani & M. Turnip, 2014).

The Problem-Based Learning (PBL) model focuses on issues and questions that can guide students to develop problem-solving skills with appropriate concepts and principles. This, of course, relates to students' literacy in aiding problem-solving. The stages that students go through in the PBL learning model involve engaging in literacy to find solutions (Giriyanti, 2017). The PBL model is considered inseparable from the literacy activities carried out by students. To optimize students' literacy, there is a need for specific literacy activities. Literacy activities provided to students should undoubtedly contain meaningful elements for them. This can be achieved by integrating the PBL learning model with paired literacy activities. The paired literacy technique is a modification of the paired storytelling technique, in which students are paired to engage in literacy activities based on provided readings and to write down the information they gather individually in their literacy journals, which will later be narrated or shared with their partners (Nugraha, 2018). This technique will make literacy activities carried out by students more meaningful by exchanging information. Currently, the optimization of PBL models for improving students' reading interests has not been thoroughly examined, so there is a need for classroom action research to investigate this matter.

The description of the issue highlights the importance of integrated paired literacy techniques within the Problem-Based Learning (PBL) model to be further explored to enhance the intellectual development of students through the assessment of biology learning outcomes. Therefore, there is a need for research in the form of classroom

action research titled "Integrated Paired Literacy in the Problem-Based Learning Model to Improve Biology Learning Outcomes" for XI Science 2 Students of State High School Ambulu, focusing on the topic of Reproductive System.

METHOD

The conducted research was a type of Classroom Action Research (CAR) with reference to the research design in the Kemmis and McTaggart classroom action research model, specifically the cyclic research model. This cyclic classroom action research was carried out over two cycles, with each cycle consisting of two meetings (4 learning sessions). The implementation of this CAR involved four stages that were conducted in each cycle, namely (1) planning the learning cycle, (2) implementing the learning and research actions, (3) conducting an assessment, and (4) reflecting on the stages that had been passed (Nuzulul et al., 2020). The planning in this action research was carried out by organizing planning activities within the implementation of learning or teaching modules in accordance with the PBL model, which included student activities, assessment instruments, and student worksheets (LKPD). The preparation of observation sheets and assessments for the end of the cycle was also conducted in the planning phase.

The implementation stage and actions involved carrying out the learning as per the prepared teaching module. Implementing the PBL (Problem-Based Learning) model integrated with paired literacy began with a literacy period and literacy journal filling. Following that, learning activities were conducted in accordance with the PBL model syntax. The observation phase was carried out collaboratively between the researcher and two observers, namely, the biology teacher of class XI Science 1 at Ambulu State High School and a peer colleague. The biology subject teacher played a role in observing activities in accordance with the observation sheet that focused on the teaching conducted by the teacher, while peer observers were responsible for observing student activities. The reflection phase involved collecting data obtained during the observation, including the results of the teacher's activity observation instruments, the results of student activity assessment instruments, and student assessments. Subsequently, the data was analyzed and reflected upon together with the observer.

A series of classroom action research studies, from the planning of cycle 1 to the reflection of cycle 2 and the preparation of this research report, were conducted over a period of 5 weeks from May 3, 2023, to June 7, 2023, in the XI Science 2 class of Ambulu State Senior High School for the academic year 2022/2023. The participants in this research were 36 students of XI Science 2 in the second semester of Ambulu State Senior High School, consisting of 25 female students and 11 male students, who played the role of subjects in this research. The object of research in this classroom action was the learning outcomes of biology on the topic of the reproductive system obtained by the students. The type of data collected was quantitative data obtained from students, teachers, and documents. Quantitative data was presented in the form of numbers or scores derived from qualitative data. This research utilized quantitative

data in the form of students' learning outcomes on the reproductive system topic collected from formative test scores in cycles I and II. Test data was obtained after the implementation of the Problem-Based Learning (PBL) model in each of its cycles. The data obtained from the documents consisted of the student grades of class XI Science 2 on the previous material. The data collection tool was in the form of formative test questions conducted at the end of each cycle.

RESULTS AND DISCUSSION

The classroom action research (CAR) that has been conducted aims to develop students' critical, analytical, and reflective thinking skills in comprehending information as an effort to enhance the learning outcomes of biology students. This research consisted of two cycles. Each research cycle consisted of two meetings and concluded with an evaluation at the end of each cycle. Cycle II was an improvement cycle implemented using treatments that had been refined based on the evaluation results of Cycle I. The implementation of this research begins with developing learning materials in the form of a teaching module instructional content in the form of podcasts, PowerPoint presentations, videos, and assessment instruments. Each cycle's implementation takes place over 4 teaching hours, with details of 3 teaching hours used as the learning process that starts with paired literacy activities and continues with the PBL (Problem-Based Learning) model. Subsequently, an evaluation is conducted for 1 teaching hour. Based on the research results obtained through classroom action, students' learning outcomes in Cycle II showed improvement compared to Cycle I. Assessment of learning outcomes is carried out during the final cycle evaluation. The improvement in students' learning outcomes can be observed in Table 1.

Table 1. Improvement in Student Learning Outcomes

Learning Outcome	Cycle I		Cycle II	
	Number of Students	Percentage (%)	Number of Students	Percentage (%)
Score \leq 74 (Not pass)	18	50	14	38.88
Score \geq 75 (Pass)	18	50	22	61.11
Average Score	72.14		75.33	

Table 1 shows the average learning outcomes of the reproductive system material, which improved in both Cycle I and Cycle II. The learning outcomes in Cycle I had an average score of 72.14, which did not meet the school's success indicator of \geq 75. The classical completion percentage in Cycle I reached 50%, with 18 students scoring \leq 74. The classical completion percentage of learning outcomes in Cycle I had the same value as the unsuccessful outcomes. Therefore, it can be concluded that the learning outcomes achieved by students in Cycle I were not successful.

The average scores for Cycle II displayed in the table indicate a figure of 75.33, which has met the success indicator of \geq 75 for the average score. The classical mastery percentage in Cycle II reached 61.11%, with 22 out of 36 students achieving scores that meet the criteria (\geq 75). Therefore, the classical mastery percentage for

learning outcomes in Cycle II has surpassed the success indicator of more than 50%. Based on the student's learning outcomes in Cycle II, it can be assessed that there has been an improvement in students' learning outcomes by observing the average scores and the percentage of students meeting the criteria in a PBL model integrated with paired literacy techniques, as it has fulfilled the success indicator in accordance with what has been determined. This aligns with what was conveyed by Novitasari et al. (2015), who stated the advantages of using problem-based models, such as a deeper level of student retention and improved comprehension of teaching materials. It enhances the focus on relevant knowledge, encourages habitual thinking, fosters teamwork skills, nurtures leadership qualities, and enhances social relations skills. Moreover, it cultivates effective learning, provides motivation for learning, and is realistic in the context of students' lives. Based on the learning outcomes data obtained from the students, it is evident that implementing the Problem-Based Learning (PBL) model can enhance students' learning outcomes (Rerung et al., 2017). The Problem-Based Learning (PBL) learning model is an innovative model that provides an active and responsive learning environment to students.

The success of improving cognitive abilities, as presented in the learning outcomes, is affected by the presence of evaluation and follow-up plans conducted at the end of cycle I. Thus, the implementation of cycle II aims to rectify and refine the constraints that occurred during cycle I. The treatment modification implemented in cycle II involves the addition of instructional media in the form of audio to help students understand the material in more detail. Additionally, there are improvements in the paired literacy activities with more detailed responsibilities in writing literacy journals. Through these treatment modifications, literacy skills can be developed evenly in each literacy pair. As reflected in Table 1, the improvement in biology learning outcomes related to the reproductive system in students can be seen in the following graph:

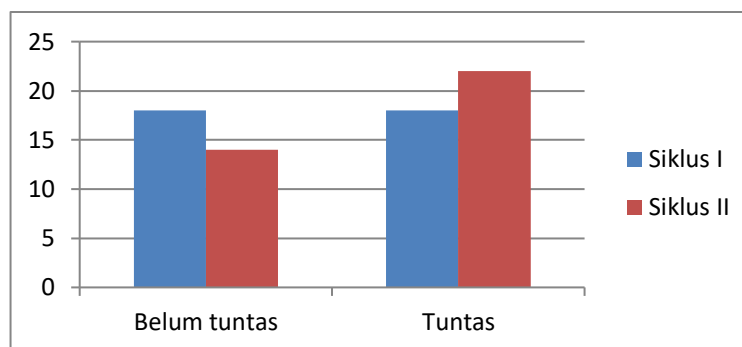


Figure 1. The Number of Students Who Passed the Learning Outcomes in Cycle I and Cycle II
Note: Belum Tuntas = Not Passed; Tuntas = Passed; Siklus I = Cycle I; Siklus II = Cycle II

The figure above illustrates the number of students who have achieved learning outcomes according to the specified criteria. In the figure, it is evident that the red bars represent Cycle II, which has a total number of students who have completed their studies, surpassing the total number of students who have not. This can be attributed to the improvement in the previously implemented approach in Cycle I, where each

literacy pair only wrote one literacy journal. In Cycle II, each student wrote their own literacy journal. With these improvements, every student will strive to comprehend the provided readings and will be encouraged to effectively convey the information they read and discuss with their partners in written form. The efforts exerted by the students to meet the literacy journal target will shape their literacy skills, which can have an impact on their learning outcomes, supported by the PBL model. This is further substantiated by research conducted by Widiyana (2021), which states that the PBL model necessitates students to read in order to obtain solutions, indirectly fostering literacy skills.

Implementing PBL integrated with paired literacy techniques can cultivate a reading culture among students, impacting their cognitive levels and learning outcomes. The high level of literacy skills in students is attributed to learning through the PBL model and the effect of students' literacy levels through paired literacy activities, which can shape students' capability of comprehensively understanding the material and will affect students' cognitive outcomes. PBL syntax that can enhance students' cognitive outcomes includes group discussion activities, where students actively share ideas and solutions that facilitate problem-solving through literacy activities (Widiyana, 2021). Evaluating scientific investigations in the syntax of the PBL model can encourage students to formulate the problems provided in the worksheets. The PBL model can also strengthen students' data interpretation skills, further supported by literacy activities. These three elements are embedded in the PBL syntax and integrated with literacy activities, which can stimulate students to process information and think more constructively, thereby enhancing students' cognitive outcomes.

This problem-based learning approach can help students become independent learners. This is supported by research (Styorini, 2018), which states that the PBL model can train and develop students' independence through problem-solving activities oriented toward students' actual lives. Learning activities using the PBL model provide a contextual learning experience. Contextual learning significantly enhances students' cognitive learning outcomes (Oktafiani et al., 2022). Thus, the PBL model is considered effective in fostering students' independence. Improvements in the second cycle show the strategies employed by teachers to cultivate students' independence in managing information through literacy activities. With full responsibility for the targeted literacy journal, students will strive to optimize their understanding of the provided readings. The appropriate combination of the PBL model with paired literacy techniques is capable of enhancing students' learning outcomes by creating meaningful learning experiences.

Paired literacy provides a joyful literacy experience for students. This innovation can counteract students' perception of literacy as boring. By engaging in paired literacy, students can exchange information and understand the same reading material. This is in line with the opinion of Salichah (2021), who stated that paired discussion activities can enhance students' motivation and interest in literacy and other learning activities. Paired literacy, which encourages students to share information,

can also shape a comprehensive understanding of knowledge, thus affecting the students' cognitive outcomes. Through this paired literacy activity, it can enhance students' direct participation in the learning activities facilitated by the teacher (Widiyana, 2021). With the active participation of the students, they can improve their understanding of new knowledge, enabling them to build their comprehension independently. The flow of learning activities like this will encourage students to think actively and ultimately lead to improvements in their cognitive abilities and learning outcomes. This is supported by the opinion of Yuriza et al. (2018) that literacy skills are capable of enhancing intellectual development, which includes thinking logically, being easily understood, and improving abstract reasoning. Another opinion suggests that literacy skills are related to students' High Order Thinking Skills. They are able to distinguish ideas clearly, think clearly, find solutions, and provide more apparent arguments about difficult matters (Dinni, 2018).

Based on research conducted over 2 cycles on students as a whole regarding the biology lesson on the reproductive system, it can be observed that there has been an improvement in the students' learning outcomes through paired literacy activities integrated with the PBL model, which is capable of promoting independence among the students. This is evident from the increase in students' learning outcomes following the application of the integrated PBL model with paired literacy techniques, which has met the minimum criteria of ≥ 75 in a classical manner.

CONCLUSION AND RECOMENDATION

Implementing paired literacy techniques integrated with a problem-based learning model can improve learning outcomes for students in class XI Science 2 at State Senior High School Ambulu, Jember Regency, particularly regarding Reproductive Systems. The students' learning outcomes improved by 61.11%, supported by the practice of paired literacy during problem-based learning. The application of paired literacy techniques within the PBL model not only enhances learning outcomes but also fosters students' independence and their ability to collaborate effectively. The Problem-Based Learning (PBL) model integrated with paired literacy techniques is highly suitable for use in biology lessons with challenging material characteristics. Based on the research conducted, the researcher recommends that in future studies, the problem-based model be applied to develop students' scientific literacy skills by increasing the intensity of literacy activities in their learning process.

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