



Does the PBL-RQA Model Improve Students' Information Literacy and Self-Confidence?

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Abstract

Several studies show that students' information literacy and self-confidence are still low and need to be improved. Students find the biological material on the digestive and respiratory systems particularly challenging because it explains the complex interactions between the structure, function, and symptoms of the disorders these systems cause and their uncommon scientific names. This study determined how Problem-Based Learning integrated with the Reading, Questioning, and Answering (PBL-RQA) model affects students' information literacy and self-confidence. Using a quasi-experimental with a nonrandomized control-group pretest-posttest design, 96 students from junior high school in Bangkalan Regency, East Java, Indonesia were sampled for the study. They were divided into one experimental class and two control classes. The PBL-RQA model was taught in the experimental class, while the PBL and RQA models were each taught in the control class. Information literacy was acquired through an essay test, and self-confidence was acquired through a questionnaire given using Google Forms. The analysis was conducted using the ANCOVA test with a significance level of 5% and then followed up with the least significant difference test. Students in the PBL-RQA class achieved the highest mean scores in information literacy and self-confidence, with 79.19 and 78.50, respectively. Based on the results, PBL-RQA learners significantly increased information literacy and self-confidence than PBL and RQA.

Keywords: PBL-RQA, Information Literacy, Self-Confidence

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INTRODUCTION

The development of the times, which is in line with the rapid progress of technology, has an impact on the ease of access to information widely and unlimitedly (Park et al., 2021). The abundance of information raises questions about its authenticity and truth, making it a big challenge for students to obtain quality information amidst the information explosion (Encheva et al., 2020). The ability to find, evaluate, and use information effectively and efficiently is called information literacy (Avcı & Ergün, 2022; Guerola-Navarro et al., 2023). Information literacy can make students individuals who are "literate" about information, insightful, and able to control learning independently (Uslu & Durak, 2022).

Information literacy is essential to apply in scientific methods and learning. However, several studies reveal that students' information literacy is still low and needs to be improved. Schiff's (2020) research shows students' inability to find and evaluate information appropriate to the problem's context. The survey conducted by Svensson et al. (2022) shows that students can find relevant information but still need help distinguishing between accurate and inaccurate information. Similar research reveals that students have difficulty accessing and using information ethically and legally, so plagiarism is high (Jones & Procter, 2023). The low information literacy of students is also supported by the results of a survey using a

questionnaire at UPTD SMP Negeri 1 Kamal, Indonesia, in June 2023, which shows that 64.63% of students can determine and access information according to context. However, the reference source used is not accurate, namely Brainly (48.17%), YouTube (31.10%), Blogspot (7.93%), and Wikipedia (3.66%), and only 9.14% of students used science books as an accurate reference source.

The low of information literacy can affect students' level of self-confidence because students' ability to collect and use information effectively can give them confidence in their abilities and vice versa (Medaille et al., 2021; Bacarrisas, 2023). Self-confidence is a positive attitude that believes in one's abilities and strengths to achieve goals in life. The level of self-confidence influences how students view and interact with the environment, so students are believed to learn well when they feel confident (Harris et al., 2021). Self-confidence can encourage students to maximize their abilities without fear and anxiety about failure (Omer, 2016; Hamzah et al., 2020).

Students need to master self-confidence. However, several studies have revealed that students' self-confidence is still low and needs to be improved. Research by Bessa et al. (2021) shows that students need to fully understand and explore their abilities, which results in low self-confidence. Schuh et al. (2023) research shows that poor student competence indicates low self-confidence and vice versa. Similar research reveals that students' self-confidence levels are below average (Hong et al., 2023). The low self-confidence of students is also supported by the results of a survey using a questionnaire at UPTD SMP Negeri 1 Kamal, Indonesia, in June 2023, which shows that 20.33% of students believe in their abilities, 20.12% can act independently in making decisions, 48.78% have a positive self-concept, and 15.24% dare to express their opinions.

Information literacy and self-confidence can be empowered through learning, one of which is biology. Biology is said to be a science that represents natural science because most of the biology material is oriented toward science process skills (Shen et al., 2018). Biological material, especially the digestive and respiratory systems, is considered problematic by students because the material discusses the relationship between the structure, function and symptoms of the diseases they cause and their complex workings with unfamiliar scientific names (Setiawati et al., 2019; Ristanto et al., 2021). The sub-achievement of phase D learning in the independent curriculum for junior high school in 7th grade is students' ability to analyze, so they must be trained in high-level thinking skills and literacy to support biology learning.

Biology is closely related to science skills to deal with phenomena in the surrounding environment, thus requiring students to be actively involved in learning (Lombardi et al., 2021). One learning model that involves active students is Problem-Based Learning (PBL). PBL is a learning model that presents authentic problems as a starting point for investigation and continues by synthesizing solutions to these problems to encourage students to think at a higher level (Cho & Hwang, 2019). PBL is not a process of memorizing, storing and understanding a concept but is used to apply and relate learning concepts to real situations. Therefore, learning activities that apply PBL become more meaningful for students because they raise and examine issues that occur in the environment (Lee et al., 2017).

Implementing PBL helps students overcome problems, but there are still obstacles during the learning process. PBL takes longer to implement with a learning concept that is too broad, so students need to search for more information (Ghufron & Ermawati, 2018; El-Khawanky, 2020). Students also need help solving problems due to a need for initial knowledge regarding the topics discussed due to low interest in reading (Ghani et al., 2021). Therefore, there is a need for integration with other models that can overcome these obstacles.

The Reading, Questioning and Answering (RQA) model is a learning model that encourages students to discover essential concepts through reading activities, then compose questions and find their answers using several sources (Hariyadi et al., 2018). Students are directed to analyze reading critically and interpret it through questions (Baqi, 2019). The RQA

model can help students understand concepts first as initial knowledge to solve problems, making it suitable for integration with the PBL model (Bahri & Idris, 2018).

Research discussing the effectiveness of Problem-Based Learning integrated with Reading, Questioning and Answering (PBL-RQA) in learning has yet to be carried out and is still very limited. Previous research conducted by Bahri et al. (2020) showed that PBL-RQA can improve self-regulated learning on animal physiology topics. Other research also reveals that digital and scientific literacy on genetics topics has increased after being taught using PBL-RQA (Angraini et al., 2023). Similar research was conducted by Leasa et al. (2023), which proves that PBL-RQA can improve critical thinking skills in science learning. Therefore, this research aims to determine the effect of PBL-RQA on students' information literacy and self-confidence. The novelty of this research focused on increasing students' information literacy and self-confidence in the digestive and respiratory systems, which have never been studied before. This research also had a different sample size and educational level than earlier studies. Contrary to conventional learning, this research employed PBL and RQA models as the control classes.

METHOD

Research Design

This research is a quasi-experiment research using a nonrandomized control-group pretest-posttest design. The research design is listed in Table 1.

Table 1. Research Design

Group	Pretest	Treatment	Posttest
PBL-RQA	O ₁	X ₁	O ₂
PBL	O ₃	X ₂	O ₄
RQA	O ₅	X ₃	O ₆

Source: Leedy & Ormrod (2015)

The research was carried out in September-October in the 2023/2024 academic year. Learning is carried out using three classes offline. The differences between the three classes are based on the use of learning models, namely PBL-RQA, PBL, and RQA. The experimental class applies the PBL-RQA model, while the control class applies the PBL and RQA model. The learning activities of the three classes are explained in detail in Table 2.

Table 2. Learning Activities

Model	Syntax	Material
PBL-RQA	The PBL-RQA learning stages are as follows: (1) orienting students to the problem and directing them to read literature, (2) students making questions about the reading material and related problems and then answering these questions, (3) organizing students to learn, (4) guiding group investigations and discussing the answers and questions that have been created, (5) developing and presenting the results of discussions through group presentations, and (6) evaluating the problem investigation process (Bahri & Idris, 2018).	Biological material (1 material each week) includes (1) the relationship between the structure and function of human digestive organs and the phenomenon of choking, (2) disorders of the human digestive organs and efforts to prevent them, one of which is the relationship between diet and gastritis, (3) the relationship between structure and function of human respiratory organs on the phenomenon of breathing through the oral cavity,

Model	Syntax	Material
		(4) disorders of human respiratory organs and prevention efforts, one of which is the relationship between smoking and lung cancer.
PBL	The PBL learning stages are as follows: (1) orientation of students towards problems, (2) organization of students to learn, (3) guiding group investigations, (4) developing and presenting work results, and (5) evaluation of the problem investigation process (Arends, 2012).	Same with PBL-RQA
RQA	The RQA learning stages are as follows: (1) reading, (2) questioning, and (3) answering (Saputri & Corebima, 2020).	Same with PBL-RQA

Respondent

This research has received approval from the school and participating students. The research sample consisted of three classes, with 32 students in each class representing the entire 7th grade population at UPTD SMP Negeri 1 Kamal, Bangkalan Regency, East Java, Indonesia. A random sampling technique was used to determine the experimental and control classes. However, the three classes need to be tested for equality first using the normality, homogeneity, and ANOVA tests, which refer to the previous semester's final exam scores for science subjects. The normality test results stated that the values from the three classes were normally distributed with a p-value of $0.200 > 0.05$. The homogeneity test results stated that the values of the three classes were homogeneous, with a p-value of $0.693 > 0.05$. The results of the ANOVA test also stated that there was no difference in prior knowledge in the three classes, with a p-value of $0.184 > 0.05$. Therefore, it can be concluded that the three classes are equivalent.

Research Instruments

Students' information literacy was measured using a multiple-choice test with 30 questions. In contrast, students' self-confidence was measured using a questionnaire with 25 statements, 14 positive and 11 negative statements. All instruments are distributed via Google Forms. The instruments used have been tested for validity and reliability. The results of the empirical validity test using Pearson Product-Moment analysis show that the significance value is smaller than 0.05, so all question items are declared valid. Apart from that, the results of empirical reliability testing using Cronbach's Alpha analysis stated that the question items were reliable, with an alpha value of 0.75.

Data Analysis

Information literacy and self-confidence data obtained from each treatment were analyzed descriptively using mean values. The data was also analyzed inferentially using ANCOVA with a significance level of 5% and followed by the Least Significant Difference test to find out which treatments were significantly different. Before the research data was analyzed using ANCOVA, a requirement test was carried out: a normality test using One-Sample Kolmogorov-Smirnov and a homogeneity test using Levene's Test of Equality of Error Variances.

RESULTS AND DISCUSSION

Results

The descriptive analysis results show that the information literacy score has increased. The highest score was 79.19 in the PBL-RQA class, while the lowest was 72.09 in the RQA class. The N-gain score obtained in the PBL-RQA class was 0.59, which states that the model is quite effective to be applied (Figure 1).

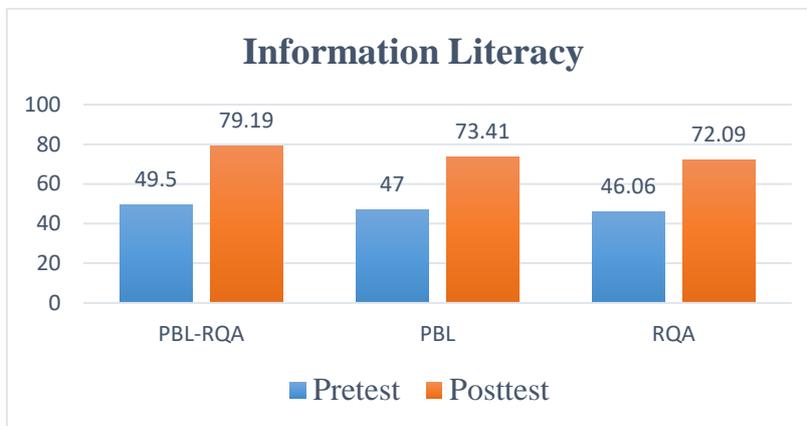


Figure 1. Average Value of Students' Information Literacy

The descriptive analysis results also show the increasing scores on self-confidence. The highest score was 78.50 in the PBL-RQA class, while the lowest was 72.91 in the RQA class. The N-gain score obtained in the PBL-RQA class was 0.52, which states that the model is quite effective to be applied (Figure 2).

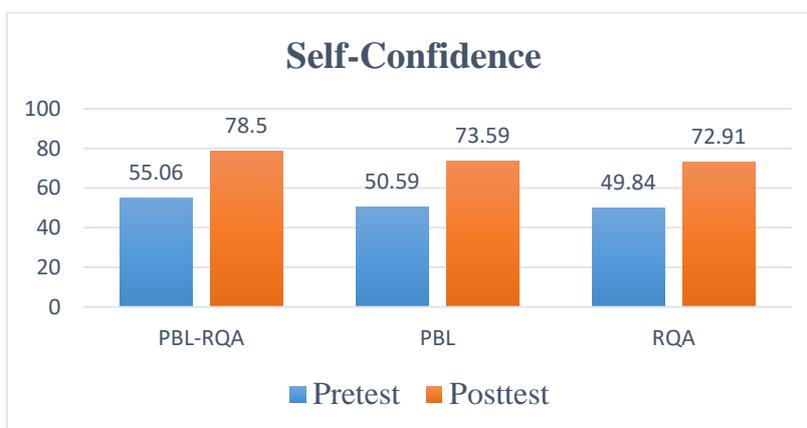


Figure 2. Average Value of Students' Self-Confidence

The normality test results show that each variable's significance value for the pretest and posttest is more significant than 0.05. These results indicate that information literacy and self-confidence data are normally distributed (Table 3).

Table 3. Normality Test Results with One-Sample Kolmogorov-Smirnov

No	Variable	Significance		Data Distribution
		Pretest	Posttest	
1.	Information Literacy	0.200	0.062	Normal
2.	Self-Confidence	0.184	0.200	Normal

The homogeneity test results show that each variable's significance value for the pretest and posttest is more significant than 0.05. These results indicate that the variance of pretest and posttest data on information literacy and self-confidence are homogeneous (Table 4).

Table 4. Homogeneity Test Results with Levene's Test of Equality of Error Variances

No	Variable	Significance		Data Variance
		Pretest	Posttest	
1.	Information Literacy	0.113	0.431	Homogeneous
2.	Self-Confidence	0.156	0.403	Homogeneous

The ANCOVA test results show that the model significance value for information literacy is 0.000 and smaller than 0.05. These results indicate that the learning model significantly affects information literacy (Table 5).

Table 5. ANCOVA Test Results on Information Literacy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2093.290 ^a	3	697.763	37.286	.000	.549
Intercept	12356.589	1	12356.589	660.293	.000	.878
Pretest	1181.644	1	1181.644	63.143	.000	.407
Model	1485.171	2	742.586	39.681	.000	.463
Error	1721.669	92	18.714			
Total	542316.000	96				
Corrected Total	3814.958	95				

a. R Squared = .549 (Adjusted R Squared = .534)

The ANCOVA test results show that the model significance value for self-confidence is 0.000 and smaller than 0.05. These results indicate that the learning model significantly affects self-confidence (Table 6).

Table 6. ANCOVA Test Results on Self-Confidence

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	863.227 ^a	3	287.742	53.288	.000	.635
Intercept	6438.694	1	6438.694	1192.415	.000	.928
Pretest	267.664	1	267.664	49.570	.016	.350
Model	850.865	2	425.432	78.788	.000	.631
Error	496.773	92	5.400			
Total	541360.000	96				
Corrected Total	1360.000	95				

a. R Squared = .635 (Adjusted R Squared = .623)

The Least Significant Difference test results show that the PBL-RQA model significantly increases students' information literacy compared to the other models (Table 7).

Table 7. Least Significant Difference Test Results on Information Literacy

Class	Value	Notation
RQA	72.09 ± 6.512	a
PBL	73.41 ± 5.339	a
PBL-RQA	79.19 ± 4.768	b

Value Description: Mean ± Standard Deviation

The Least Significant Difference test results show that the PBL-RQA model significantly increases students' self-confidence compared to the other models (Table 8).

Table 8. Least Significant Difference Test Results on Self-Confidence

Class	Value	Notation
RQA	72.91 ± 3.062	a
PBL	73.59 ± 3.130	a
PBL-RQA	78.50 ± 2.342	b

Value Description: Mean ± Standard Deviation

Discussion

The results of the ANCOVA test (Table 5 and Table 6) show that the learning model significantly affects students' information literacy and self-confidence. However, the PBL-RQA model is more effective in increasing students' information literacy and self-confidence than the PBL and RQA models. This statement refers to the Least Significant Difference test (Table 7 and Table 8), which shows that the PBL-RQA model is superior to the PBL and RQA models in the same group. The PBL-RQA model can provide new experiences for students through activities ranging from searching for literature, summarizing reading, compiling problem formulations, proposing solutions to solve problems, and discussions between groups. This statement aligns with Panke (2019) and Razali et al. (2022) who revealed that learning strategies and methods can encourage students' activeness in asking questions and giving opinions, as well as improving students' thinking abilities.

Students' problem-solving thinking abilities can be honed using the PBL model (Fitriani et al., 2020; Funa & Prudente, 2021). The RQA model also increases students' knowledge and curiosity through reading activities and asking questions (Bustami et al., 2020; Zubaidah et al., 2020). However, combining PBL and RQA significantly increases information literacy and self-confidence because students are directed to search for and organize information according to their needs to resolve problems (Angraini et al., 2023).

The PBL-RQA model consists of 6 phases, namely orienting students to the problem and directing them to read literature, creating and answering questions related to the problem, organizing students to learn, guiding investigations in groups and discussing answers and questions that have been created, developing and conveying the results of discussions through group presentations, as well as evaluating the problem investigation process (Bahri & Idris, 2018). PBL-RQA syntax can encourage students to learn independently and maximize their potential actively (Hadiyanti et al., 2016). This statement aligns with Soto & Marzocchi (2021) that active learning can increase students' understanding.

The PBL-RQA stage, namely orienting students to the problem and directing them to read literature, impacts increasing information literacy. Based on the discourse presented, students are directed to determine the information needed to find problems. Students can search for essential information and deepen their knowledge about the problem by reading and asking questions (Asmara et al., 2023). In line with research by Ceyhan & Yıldız (2020) and also Salmon & Barrera (2021), reading and asking questions can improve students' thinking abilities and understanding of a topic.

The next stage of PBL-RQA, namely creating and answering questions related to the problem, can increase information literacy. When composing questions, students actively process information, identify knowledge needs, and build a sharper frame of mind. Likewise, in answering questions, students are directed to access the necessary and relevant information from books and the internet. Information can be widely accessed by using good search strategies (Folk, 2021). All forms of information obtained are adjusted to the scope of the problem and need to be evaluated critically regarding the sources used as references (Jankowski & Sawyer, 2019). The source of information used as a reference is scientific and can be verified for its truth to avoid misconceptions (Soeharto & Csapó, 2022).

The next stage of PBL-RQA, namely guiding investigations in groups and discussing the answers and questions that have been created, turns out to be able to practice information literacy. Students are directed to use information effectively to achieve specific goals, namely, finding the most appropriate solution to solve problems. Students can search, organize and synthesize information from various scientific sources that are relevant to the problem (Lvquan, 2020). The skill to paraphrase sentences is necessary to avoid plagiarism. Using citations and a bibliography can also avoid plagiarism (Shoyukhi et al., 2023). This stage facilitates group discussion activities besides critical reading skills and sentence paraphrasing. Discussion activities can broaden students' understanding through exchanging perspectives and interpreting information, even enriching the understanding of information from points of view that may not be considered individually (Rahmi & Azrul, 2022).

Increased information literacy affects the level of self-confidence. The pretest and posttest results show that students' self-confidence increases along with information literacy. Students who can find information to solve problems can increase their self-confidence in their abilities. This statement is supported by the fact that students' competencies indicate high self-confidence (Gottlieb et al., 2022). Students' ability to determine the most effective solution also indicates that students can decide for themselves based on the results of logical thinking and without coercion from others. This statement aligns with Peciuliauskiene et al. (2022) research, which states that determining and evaluating information is based on students' thinking abilities. Students with good thinking skills will have more freedom to express their opinions and will not fear being intimidated by others (Bedford, 2021).

Research that has been conducted proves that the PBL-RQA model is effective in increasing students' information literacy and self-confidence. However, the application of PBL-RQA certainly has obstacles, namely the difficulty of keeping students focused and enthusiastic during learning because the PBL-RQA syntax has more varied activities than PBL and RQA. Therefore, it is necessary to provide an apperception to attract students' interest and carry out ice breaks during learning to refresh their minds. Researchers also need more time to correct students' assignments in the form of summaries. However, researchers can overcome these obstacles by optimizing time. Apart from that, this research is only limited to the material on the digestive and respiratory systems in the 7th grade, so it is hoped that similar research can be carried out on different topics.

CONCLUSION

The PBL-RQA, PBL, and RQA models can increase students' information literacy and self-confidence. However, among the three models, the PBL-RQA model has more significant effect in increasing students' information literacy and self-confidence than the PBL and RQA models, so the PBL-RQA model can be used as an alternative for biology learning in the classroom.

RECOMMENDATION

The implementation of PBL-RQA needs to be studied more deeply on different topics at higher levels of education so that learning effectiveness is more accurate. In addition, it is hoped that external factors that influence the implementation of PBL-RQA, such as learning motivation, tutoring, and intellectual intelligence, can be studied more widely.

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