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The Effect of the PQ4R Model Assisted by E-Book Application Sway Students' Scientific Literacy Excretion System Materials for Class XI MAN Palangka Raya City

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Abstract
This research is based on learning conditions in class XI MAN Palangka Raya City which still uses discussion and lecture models that are less able to improve scientific literacy skills. This research aims to determine the effect of the PQ4R model assisted by e-books using the sway on the scientific literacy of XI grade students of MAN PalangkaRaya City in the matter of the excretory system. The design used in this research is in the form of a quasi-experimental and the form of the design is divided into 2 groups, namely the experimental group and the control group, also called the Non-equivalent Control Group Design, and uses descriptive quantitative calculations. The sample in this research has a total of 67 students which includes, XI MIPA 3 totaling 33 students in the experimental class, and XI MIPA 4 totaling 34 students in the control class.is purposive sampling. The scientific literacy data collection method was taken from the results of the scientific literacy test. The results of the research using an independent sample t-test analysis showed that there was an effect of the PQ4R model assisted by e-book application Sway on the scientific literacy of class XI MAN Palangka Raya students on the excretory system material with a value of $t_{count} > t_{table}$, which is 5,319 > 5,299 .learning model supported by the Sway e-book application PQ4R can improve scientific literacy.

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INTRODUCTION

The progress of education today goes through various long stages from time to time. The development of science and technology has triggered a revolution in the field of education. (Arief, 2015) The current conditions in the industrial revolution 4.0 require educational institutions to have good skills and understand technology and science, can think rationally, and analytically (Septikasari & Frasandy, 2018). Understanding science is also known as scientific literacy skills, namely learning science skills, informing science, and solving a problem to have an attitude and concern for the environment and oneself in making a choice based on various scientific opinions (Yuliati, 2017). Scientific literacy is a person's skill when solving problems using a scientific knowledge approach and scientific concepts and being able to understand the interaction of science, society, and technology (Odja, A. H

& Payu, 2014). This scientific literacy is a must for every educational institution so that it can become a necessity in the learning process (Gherardini, 2016).

Based on the results of an interview with one of the biology teachers at MAN Palangka Raya, the teaching process carried out always uses the teaching method with the teacher as the center of learning and students only understand the explanation from the teacher. This learning pattern causes students to be less able to solve a problem. Based on the results of interviews with biology subject teachers, students' KKB scores are still lacking. The school set KKB on biology subjects and 75 on excretory system material. According to the biology teacher, sometimes teachers have difficulty in teaching the excretory system material which is less understandable to the naked eye and requires models and media that can support aspects of scientific literacy. The media used in the teaching process is only limited to the use of whiteboards, LCD projectors, and lecture and discussion learning models.

The right learning model in teaching and learning can improve students' scientific literacy on excretory system material. The PQ4R model emphasizes reading so that it can help students remember and solve a problem so that it is suitable to be applied in biology learning on excretory system material. Because students are required to be able to solve a problem, scientific and critical thinking on existing scientific phenomena, science skills become better (Febryana, 2020).

The PQ4R model can be better supported using suitable media. The media used is in the form of an e-book with the application Sway. The use of e-books allows students to remember reading, solve problems and give a conclusion from the reading results. E-books using the sway have the advantage of attracting interest and improving students' skills in utilizing current technology and making the learning process more interactive (Haris, 2011; Kusmana, 2017). media E-book application sway is appropriate for use on abstract excretory system material. The e-book features pictures, animations, and videos with structured explanations and attractive formats to increase students' enthusiasm for teaching and learning (Agustin et al., 2021; Ardian et al., 2020; Waskitorini & Arifendi, 2021).

Teachers need to understand students and learning methods in teaching and learning activities, especially those related to the use of learning models. So that the material can be understood by students in the excretory system material, it is necessary to use the Preview, Question, Read, Reflect, Recite, and Review (PQ4R) model with the help of an e-book using the sway.

There have been many studies examining the PQ4R learning model, but the PQ4R model with the help of e-books using the sway in this research has not been widely carried out by previous research. Research related to the PQ4R model on scientific literacy has been proven to improve student competence in learning. This evidence has been researched by Lestari (2019) that the PQ4R model can have a positive effect on students' scientific literacy in understanding students' processes, contexts, and science concepts. Based on the previous explanation, there is a need for research with the title of the effect of the PQ4R model assisted by e-book application Sway on the scientific literacy of students' excretory system material for class XI MAN Palangka Raya City.

METHODS

Research Design

The quasi-experimental or quasi-experimental method, the author uses in this research. The form of the design used is a design that is divided into 2 groups, namely the

experimental class and the control class or known as the non-equivalent control group design (Sugiyono, 2016). From the previous description, the author uses descriptive quantitative calculations in carrying out this research.

Population and Sample

The population of this research is all students of class XI MIPA MAN Palangka Raya City with the sampling method used is purposive sampling which aims to select samples based on certain considerations (Sugiyono, 2016). These considerations were chosen based on interviews with teachers that the students of class XI still had difficulties in scientific literacy skills. The research sample had a total of 67 students including 32 students in class XI MIPA 3 in the experimental class and class XI MIPA 4 with 33 students in the control class. The reason for taking the two samples is because the two samples have the same criteria and abilities and the sample still has many difficulties in scientific literacy skills.

Data Collection Methods

Data collection in this research was used to test and non-test procedures. The test method is in the form of pre-test and post-test which is made in the form of an essay test with 12 questions. To find out students' scientific literacy, they used an instrument in the form of scientific literacy questions. The non-test method uses unstructured interviews.

Scientific literacy indicators in the knowledge aspect are divided into three parts, namely content knowledge, procedural knowledge, and epistemic knowledge. Content knowledge is knowledge related to real life, procedural knowledge is the knowledge that identifies problems in an experiment, and epistemic knowledge is the knowledge that is relevant to providing a scientific statement and considering data (Aryani, Ade Kirana & Suwono, 2016). The formulation of the instrument is adjusted to the indicators of the scientific knowledge aspect (scientific content) in Table 1.

Table 1. Science Knowledge Aspect Indicators (OECD, 2015)

Scientific Literacy Aspect	Indicator
Knowledge	Content knowledge
	Procedural knowledge
	Epistemic knowledge

Data Analysis Techniques

Scientific literacy data obtained can be analyzed using the following method (Purwanto, 2013).

$$N = \frac{R}{SM}\ x100$$

Description:
N = the value of scientific literacy skills
R = the value achieved by
SM students = the ideal maximum value

To determine the scientific literacy assessment that has been obtained the value of these results converted to a certain standard benchmarks can be seen in Table 2.

Table 2. Benchmarks of Students' Science Literacy Proficiency Level (Febryana, Noor Eka & Septiana, Nurul & Rohmadi, 2021)

Benchmark	Conversion Rate
80 - 100	Very High
61 – 80	High
41 - 60	Medium
21 - 40	Low
0 - 20	Very Low

Data Feasibility Techniques

Data feasibility is an important part that has been determined from the concepts of validation (authenticity) and reliability (credibility) (Sary, 2018). To determine the quality of the feasibility of a data can be tested through validation tests, reliability tests, test of discriminating power of questions, and test the level of difficulty of the questions.

Hypothesis Analysis Techniques

a. Prerequisite Test

The prerequisite test in this research uses normality and homogeneity tests. A normality test is a test that is tried to determine whether or not an information distribution is fair or not. On the other hand, the homogeneity test is a test to identify whether or not two variances are equal (Usmadi, 2020). The author uses an application to test the normality and homogeneity of Microsoft Office Excel 365.

b. Hypothesis Testing

The research hypothesis is in the form of a t-test which identifies whether there is a significant effect on students' scientific literacy using the PQ4R model. The t-test in analyzing the research information uses a significance level of 0.05. This research hypothesis testing is in the form of an Independent sample t-test using the SPSS 21 program with t-test criteria > table so that there is a significant effect.

RESULTS AND DISCUSSION

The results of the scientific literacy evaluation of students by practicing the PQ4R model and the conventional model are assessed using the scientific literacy test. The test given to students is in the form of essay questions, totaling 12 questions. The questions are first tested for the feasibility of the data so that the questions are suitable for use.

The following are the results of research that have been tried. The information obtained in this research has been generalized and categorized based on the level of students' scientific literacy. The average results of student scientific literacy assessments using tests can be seen in table 3. There is also a percentage of students' scientific literacy evaluations on each indicator can be seen in table 4 and figure 1.

Table 3. The Average Results of the Pre-test and Post-test of Students' Science Literacy

Class	Pre-test	Post-test	Difference (Gain)	N-gain	Description
Experiment	50,45	75,42	24,97	0,50	Medium
Control	49,35	65,56	16,62	0,32	Medium

Description: value (<*N-gain*>) < 0,3 (*N-gain*-low), value 0,7 ≤ (<*N-gain*>) ≥ 0,3 (*N-gain*-medium), value (<*N-gain*>)>0,7 (*N-gain*-tinggi),

Table 4. Evaluation Results of Each Indicator of Knowledge Aspect of Scientific Literacy

Number	Rating Indicator	Experiment Class Value (%)	Description	Control Class Value (%)	Description
1	Content Knowledge	78,41%	High	72,27%	High
2	Procedural Knowledge	78,54%	High	61,52%	High
3	Epistemic knowledge	78,41%	High	64,52%	High
	Average	*78,45%*	*High*	*66,10%*	*High*

Description: 81% – 100% (very high), 80% – 61% (high), 60% – 41% (medium), 40% – 21% (low), 20% – 0% (very low).

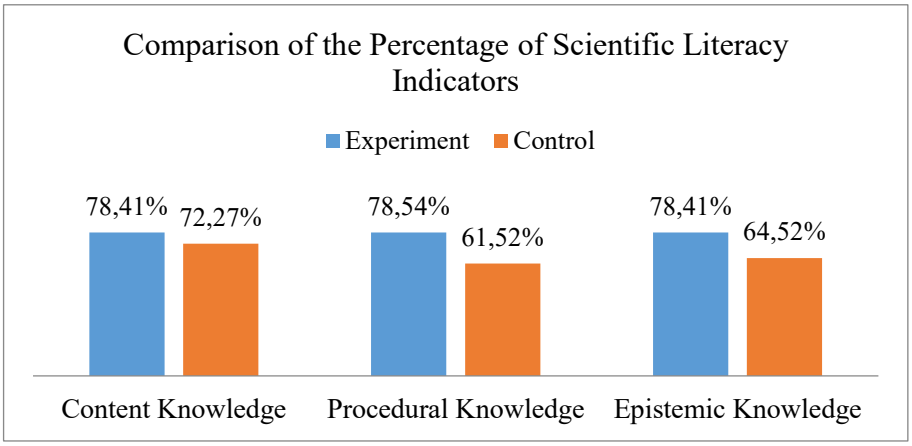

Figure 1. Comparison of the Percentage of Cognitive Test Indicators of knowledge aspects of Scientific Literacy

Prerequisite trials in this research use normality tests and homogeneity tests using applications Microsoft Office Excel 365 with Liliefors formula. Regarding the results of the post-test of science literacy in the experimental class and control class in table 4. The results of the evaluation of the homogeneity of the post-test of scientific literacy in the experimental class and control class are in table 5.

Table 4. Normality Test Results

Test Type	Experiment		Control		Description
	L_{count}	L_{table}	L_{count}	L_{table}	
Science Literacy (Post-test)	0,1542	0,1345	0,1519	0,1069	Normal Distributed

Description: $L_{count} < L_{table}$ normally distributed data

Table 5. Homogeneity Test Results

Test Type	F_{count}	F_{table}	Description
Science Literacy (Post-test)	1,6459	1,7934	Homogeneous

Description: $F_{count} < F_{table}$ then the data is homogeneous

To see the effect of the PQ4R model on scientific literacy the author used a hypothesis test in the form of an Independent sample t-test using the SPSS ver 21 program. The results t-test is shown in table 6.

Table 6. Results of the Scientific Literacy Hypothesis Test

Independent sample t-test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Science Literacy	Equal variances assumed	3.628	.061	5.319	65	.000	9.865	1.855	6.161	13.570
	Equal variances not assumed			5.299	60.476	.000	9.865	1.862	6.142	13.589

Description: $t_{count} > t_{table}$ then there is a significant effect

Evaluation of hypothesis testing using the Independent Sample T-Test test obtained the results of $t_{count} > t_{table}$, namely 5.319 > 5.299. Based on this, it can be concluded that there is a significant effect on the application of the PQ4R model assisted by e-book using the sway on the scientific literacy of students' excretory system material for class XI MIPA MAN Palangka Raya City.

The significant effect of the N-gain two sample classes shows a difference. The difference in the results of the pre-test and post-test shows that there is an increase in students' scientific literacy at the beginning and the end of learning by using the PQ4R model with the help of e-books using the sway.

The results were obtained in the experimental class with an average of 0.50 with a medium description. While in the control class with an average of 0.32 with a medium description. Average N-gain shows the average value of the experimental class has a higher value than the control class. Increasing scientific literacy using the PQ4R model supports and helps students in understanding concepts and remembering reading results (Faradita, 2019; Mahyaeny, 2018; Partami et al., 2021).

Based on the results of scientific literacy analysis on indicators of knowledge aspects using the PQ4R learning model supported by media The e-book using the sway shows that scientific literacy skills on indicators of procedural knowledge are higher than indicators of content knowledge and epistemic knowledge. The high procedural knowledge skills of students are caused by students being able to understand content knowledge well. This is supported by Zakaria (2018) students' understanding of content knowledge can find procedural knowledge because they already have a first understanding of student needs.

The assessments obtained by students for content knowledge and epistemic knowledge showed different results with low content knowledge. The low indicator of this

content knowledge student is less able to answer a statement. The results of Subaidah's research (2019) support that students are only limited to understanding and recognizing scientific knowledge but do not connect science with everyday life. While epistemic knowledge is caused by students lacking in giving an argument. This is supported by Aryani (2016) that students are less likely to give an opinion and provide a conclusion. The results of Novili's research (2017) also state that students' epistemic knowledge is still lacking in giving opinions on the problems being faced.

The results of the analysis of the knowledge aspect indicators show that the scientific literacy skills of the experimental class have higher results than the control class. The experimental class average was 78.45% and the control class average was 66.10%. The increase in these aspects occurs because of the stages contained in the PQ4R model, namely preview, question, read, reflect, recite, and review. In the preview and question, students read briefly to find key ideas and learning objectives and make a question that has been found from the reading results. Stage of reading and reflect students to respond and respond to questions that have been prepared previously and remember the subject matter and try to solve problems based on reading information. This stage supports the emergence of indicators of content knowledge and procedural knowledge. Then in the Recite and Review students make conclusions and answer questions and those that have been made confirm the conclusions from the reading material. This stage supports the emergence of epistemic knowledge indicators. According to Noviyanti et al (2015), the stages in the PQ4R model can support students to remember and understand a reading by following several steps, namely P (Preview), Q (Question), R (Read), R (Reflect), R (Recite), and R (Review).

The media e-book uses the sway which contains material, images, animations, videos, and questions that help sharpen students' scientific literacy skills so that they can have the aspects contained in the indicators of content knowledge, procedural knowledge, and epistemic knowledge. . According to Pertiwi (2018) that learning media is a means that supports the learning process. The excretory system material using the e-book application Sway is very easy and practical to use because the e-book makes various visuals so that it is easier for students to read and understand the content of the material. The use of the PQ4R model is also able to have a good impact on students because the PQ4R stages encourage students to focus more when in the learning process and the stages in the PQ4R model can be achieved with the support of the e-book used.

Using the PQ4R model with support in the form of an e-book using the sway shows an influence on scientific literacy. The e-book media is very helpful in the PQ4R model which focuses more on students in finding a problem from the reading results. With the help of the e-book application sway, it can improve students' scientific literacy in class XI MIPA MAN Palangka Raya City.

CONCLUSION

Based on the research that has been done, it can be concluded that there is a significant effect on the use of the PQ4R model assisted by e-book using the sway on the scientific literacy of students in the excretory system material for class XI MIPA MAN Palangka Raya City.

SUGGESTIONS

The suggestions put forward in this research for schools are for the learning process to use learning models to build student skills such as the PQ4R model with the help of the e-book application Sway. This research is expected to be further developed on other variables so that it can be known more broadly.

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