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The Effectiveness of PBL Assisted by Digital Storytelling Media towards Science Literacy and Critical Thinking Skills

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Abstract

The ability of scientific literacy and critical thinking are very important possessed by student. Many researchers suggested that Problem Based Learning (PBL) could enhance the students' scientific literacy and critical thinking. The use of digital storytelling media is believed to help motivate students to focus more and joyfull on learning. Therefore the study aimed to investigate the effectiveness of PBL assisted by digital storytelling media to improve the scientific literacy and critical thinking skills of fifth graders of elementary school students. This study used a mixed-methods with explanatory sequential design. Research data were collected through written tests, questionnaires, and interviews. Classical completeness tests, N-gain test, and independent sample t-test were used to test the effectiveness of the treatment. The results of triangulation analysis of the questionnaire, observation, and interview data shown that PBL learning models assisted by digital storytelling media are effective in improving students' science literacy and critical thinking skills.The digital storytelling media has helped students to understand the context, are more motivated to learn, and could facilitated students to be more critical and literate in understanding problems.

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INTRODUCTION

In this era of globalization, the skills and understanding of science and technology is the key in the progress for a nation. On the other hand, students must have critical thinking skills and high literacy so that they are not eroded in the changing times that are getting faster, this is as a basic provision to survive and compete in global competition. These skills can be obtained through education.

This is in line with the opinion of Fembriani et al., (2015) who states that by having critical thinking skills, students more easily understand concepts and they are more sensitive towards a problem so that they are more easily solve problems that occur in everyday life. According to (Hindarto, 2015), critical thinking skills are also needed to develop scientific literacy skills and they are the spirit of scientific literacy skills.

Related with the previous research, Yuliati (2017) revealed that the provision of science learning from an early age especially in elementary education can improve the students' science competence and technology literacy and critical thinking, while Wiyanto et al., (2017) added that science learning is also beneficial for foster the ability to think, behave, and act scientifically and communicate with students. Therefore; it can be concluded that science learning is very important for students. On the other hand, the selection of innovative learning media, by times, the characteristics of students, and the material taught also plays an important role in achieving learning objectives.

Reality on the field shows the quality of science learning in Indonesia is not satisfactory. This can be proven from TIMSS research results showing that the fourth-grade students' mathematics and science skills in Indonesia in 2018 gained an average score for Indonesian science reaching only 396, ranking 70th out of 78 participating countries and the results are still below the average score of science skills from OECD countries which reached 489 (OECD, 2019).

The cause of the low skills of scientific literacy according to Nadhifatuzzahro et al. (2015) was because students in Indonesia are less trained in solving critical thinking questions. Science learning in Indonesia mostly only emphasizes several facts and concepts, and educators tend to use lecture methods, it causes a lack of student motivation in participating in learning and impacting on low levels student mastery of the material delivered by educators.

It is obvious that there is a gap between real conditions and expectations, then an alternative that can be done by educators in order to improve students' scientific literacy and thinking skills is to use PBL learning models assisted by digital storytelling media. This is in accordance with the results of Ardianto & Rubini (2016), Mundzir et al., (2017) and Aiman et al., (2019) research which proves that the application of PBL learning models can improve students' scientific literacy skills. Yosepus et al., (2017), Farisi et al., (2017), Wilsa et al., (2017) and Alita et al., (2019) also proved that the application of PBL learning models was also effective to improve students' critical thinking skills. On the other hand, Karakoyun & Yapıcı (2016) proved that the use of digital storytelling in learning can also increase motivating students to participate in learning especially when used during initial activities, while Umaya et al., (2017) also proves that the use of digital storytelling also can improve student literacy skills better than ordinary tools.

Based on the description above, the objective of this study is to test the effectiveness of PBL learning methods assisted by digital storytelling media to improve the scientific literacy and critical thinking skills of fifth graders elementary school students.

METHOD

This study used mixed methods with explanatory sequential design. The experimental group (A) was treated using PBL learning models assisted by digital storytelling media, whereas in the learning control group used using PBL learning models only.

The research sample was taken using a purposive sampling method. Samples were taken from fifth graders students of State Elementary School 2 Kuanyar. There were as many as 21 students as the control class and 20 students of State Elementary School 2 Tigajuru as the experimental class. The school was chosen by the researcher as the sample because the two schools had implemented the 2013 curriculum and were located close together so that the research process could be more effective and efficient.

Data collection techniques in this study used the method of documentation, tests, observations, questionnaires, and interviews, while the instruments used in this study were quantitative and qualitative. The quantitative instrument in the form of multiple choice test questions to measure students 'scientific literacy consisted of 20 items and to measure students' critical thinking skills there were 10 items. Indicators used to measure scientific literacy refer to indicators of scientific literacy skills according to Chiapetta (1991) which has been modified by Rusilowati, et al., (2015), while indicators for critical thinking skills refer to indicators of critical thinking skills according to Ennis (1995) who are quoted by Fatmawati et al., (2014).

Qualitative instruments in the form of learning activity observation sheets were used to observe the implementation of the PBL learning model, scientific literacy skills and students 'critical thinking during the learning process. Instrument of questionnaires were used as a reflection or self-assessment related to students' scientific literacy and critical thinking skills after receiving treatment in the learning process. Otherwise, semi-structured interviews also employed to find out student responses to the implementation of learning, constraints, which are experienced during the learning process, and the benefits of following the learning process. During this session, responses from educators involved in the research process in the form of obstacles encountered and how to overcome existing obstacles were also been collected.

Quantitative data analysis techniques include validity, reliability, difficulty level, differentiation, normality, and homogeneity tests. The final analysis includes class completeness test, N-gain test, and mean difference test (independent test). Qualitative data were collected through analysis of the results of questionnaires and interviews. Those all data were triangulated and strengthened with documentation in the form of photos of the implementation of learning and documentation of student test results to answer the research questions.

RESULTS AND DISCUSSION

The learning activities of this study both the experimental and control classes were conducted four times and discussed the same material, namely theme five "Ecosystem". In the first meeting students were learnt about ecosystem, the second about the life cycle of animals, the third about the food chain and fourth of students learn about symbiosis. Both classes use the PBL learning models, the difference is in the experimental class using digital storytelling media as in Figure 1.

Figure 1. Sampel of digital storytelling media

PBL learning models has a learning syntax which consists of five phases. In the first phase, orienting students to the problem of educators conducting question and answer activities using word cards and a picture and conveying learning objectives, as well as providing motivation to students. In the second phase of organizing students to research, educators divide students into heterogeneous groups and give problems to each group. The third phase helps independent and group investigations. In the control group the educator provides textbook readings, while the experimental group provides digital media storytelling. students record every information they get to solve the problems that have been given, then carry out group discussion activities. The fourth phase is developing and presenting artifacts (work). In this activity students make work such as reports on the results of animal classifications, animal life cycle diagrams, food chain drawings, and pamphlets about symbiosis. The last stage is the fifth phase of analyzing and evaluating the problem solving process. Students hold a gallary walk to see and evaluate the work of other groups and take notes to provide input and appreciation to other groups.

The use of PBL learning models assisted by digital storytelling media was stated to be effective to improve scientific literacy skills and critical thinking skills if the mastery learning outcomes reach 75% in accordance with Basic Competence (Mulyassa, 2007: 257), the N-gain test results from the experimental group are higher from the control group (Zarkasyi et al., 2015), and the average posttest value of the experimental group was higher than the control group as seen from the results of the comparative test analysis with the Independent sample t-test analysis.

The average score of pretest and posttest of students' literacy skills

The aspect of scientific literacy skills used in this study consists of four aspects, including: (1) science as a body of knowledge, (2) science as a way of thinking, (3) science as a way of investigating, and (4) interactions between science, the environment, technology and society (interaction between science, technology, and society), As for examples of questions and answers to students to test the ability of scientific literacy can be seen in Figure 2.

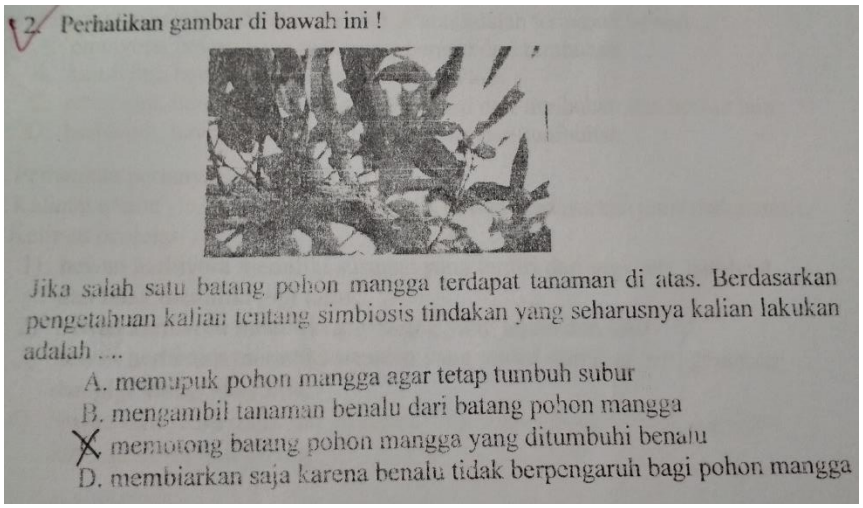


Figure 2. Examples of questions and answers to students to test the ability of scientific literacy

Figure 2. An example problem from the first aspect, science as a torso with indicators of students' ability to apply theory to solve problems. In this problem students are trained to plan an action to overcome the impact of parasitic plants, while the average results of each aspect are displayed in Table 1.

Table 1. Average Score of Scientific Literacy Skills in Every Aspect of Control and Experiment Class Students

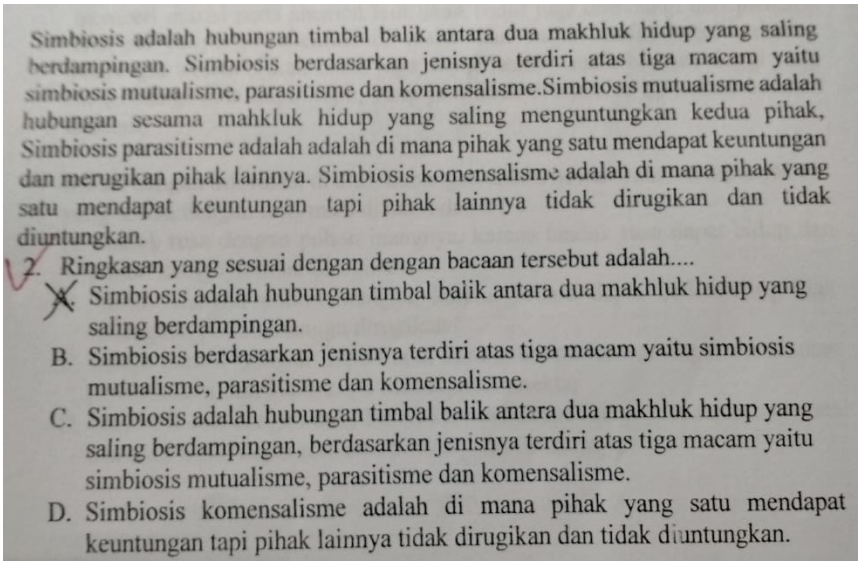
No	Scientific Literacy Aspect	Average Score			
		Control Class		Experimental Class	
		Pretest	Posttest	Pretest	Posttest
1	Aspect 1	48.81	70.24	65.25	86.25
2	Aspect 2	53.17	82.54	41.25	87.50
3	Aspect 3	54.42	78.91	60.00	85.00
4	Aspect 4	44.44	88.89	28.33	85.00

From Table 1, it can be seen that the increase in scientific literacy skills in the experimental group was higher than the control group. The results of the average score of the control class pretest is 50.21, while, the experimental class are 48.71. The posttest score of the control class is 80.15 and the experimental class is 85.95. . It can be ignored that the application of PBL learning model assisted by digital storytelling media is more effective in increasing students' scientific literacy skills compared to learning using PBL learning model alone. This is in line with the results of research conducted by Mundzir, et al., (2017) which states that the application of the PBL learning model in science learning can improve the scientific literacy skills of elementary school students because in this learning students can be directly involved in solving problems in their environment, besides the results of Lisenbee & Ford (2017) also proved that digital storytelling media can function as a literacy tool that has the ability to build students' knowledge to understand real-world experiences.

Average Score of students' critical thinking skills in pretest and posttest

There are six indicators of critical thinking skills used in this study, including (1) identifying or formulating questions (2) summarizing or core questions), (3) providing a simple explanation and (4) involving a little guessing, (5) ability to give reasons, and (6) Draw conclusions from the results of the

investigation. As for examples of questions and answers to students to test the ability of critical thinking skills can be seen in Figure 3.


Simbiosis adalah hubungan timbal balik antara dua makhluk hidup yang saling berdampingan. Simbiosis berdasarkan jenisnya terdiri atas tiga macam yaitu simbiosis mutualisme, parasitisme dan komensalisme.Simbiosis mutualisme adalah hubungan sesama mahkluk hidup yang saling menguntungkan kedua pihak, Simbiosis parasitisme adalah adalah di mana pihak yang satu mendapat keuntungan dan merugikan pihak lainnya. Simbiosis komensalisme adalah di mana pihak yang satu mendapat keuntungan tapi pihak lainnya tidak dirugikan dan tidak diuntungkan.

2. Ringkasan yang sesuai dengan dengan bacaan tersebut adalah....
   A. Simbiosis adalah hubungan timbal balik antara dua makhluk hidup yang saling berdampingan.
   B. Simbiosis berdasarkan jenisnya terdiri atas tiga macam yaitu simbiosis mutualisme, parasitisme dan komensalisme.
   C. Simbiosis adalah hubungan timbal balik antara dua makhluk hidup yang saling berdampingan, berdasarkan jenisnya terdiri atas tiga macam yaitu simbiosis mutualisme, parasitisme dan komensalisme.
   D. Simbiosis komensalisme adalah di mana pihak yang satu mendapat keuntungan tapi pihak lainnya tidak dirugikan dan tidak diuntungkan.

Figure 3. Examples of questions and answers to students to test the ability of critical thinking skills

Figure 3. Is an example problem to test critical thinking skills at fourth level thinking exercises with indicators of the ability of students to make a summary or core questions. In this problem students are trained to analyze the exact summary or core questions related to symbiosis, while the average results of each aspect can be seen in Table 2.

Table 2. Average Results of Students' Critical Thinking Skills in Control and Experiment Class

Critical Thinking Indicators	Average Score			
	Control Class		Experiment Class	
	pretest	posttest	pretest	posttest
First	57.14	80.94	65.00	80.00
Second	38.10	90.48	55.00	90.00
Third	42.86	78.57	52.50	77.50
Fourth	52.38	85.71	52.50	85.50
Fifth	42.86	71.43	45.00	77.50
Sixth	47.62	83.33	50.00	82.50

From Table 2, it can be seen that the average score of the pretest in each indicator of the critical thinking skills of the experimental class are higher when compared to the control class so that the average score of the whole indicator of the experimental class is higher than the control class.

From the results of the posttest average score, there are four indicators of the critical thinking skills of the control class that reach a higher average score than the experimental class, it is the skill to identify or formulate questions, make summaries or core questions, provide simple explanations, involve little guesswork, and draw conclusions from the results of the investigation. The experimental class average score in the posttest has a higher score in the skill to give reasons. Nevertheless, the average score of the whole experimental class is higher when compared to the control class. The overall average score of all indicators of the control class reached 81.74 while the experimental class reached 82.16.

Research by Wulandari et al., (2020) states that with the application of the PBL learning model students can have the knowledge and ability to think critically in terms of finding solutions to problems given in the learning process, while the results of Kocaman (2016) research prove that digital storytelling learning media is very useful for learning, the use of these media in the beginning of learning activities can attract student motivation in learning so that student learning achievement also increases, so it can be concluded that the application of the PBL learning model assisted by digital storytelling media is more effective in increasing students' critical thinking skills compared to learning using PBL learning models alone.

Initial Stage Analysis

Analysis of the initial stages of this study use student pretest data from both the control and experimental classes. The analysis is carried out by conducting a normality test and a homogeneity test on the pretest data.

a) Normality Test Results

Normality test is conducted to determine whether or not pretest data of students' scientific literacy skills and critical thinking skills obtained in research is normal. The hypothesis used in the normality test is:

H_0 : data are normally distributed

H_1 : data are not normally distributed

Data is said to be normally distributed if the result of sig. value > 0.05. The results of the normality test can be seen in Table 3.

Table 3. Normality Test Results in Pretest Data

Pretest Data	N	Kolmogorov-Smirnov	Sig. (2-tailed)	Means
Scientific Literacy in Experiment Class	21	1.149	0.143	Normal
Scientific Literacy in Experiment Class	20	0.465	0.982	Normal
Critical thinking in Control Class	21	0.941	0.339	Normal
Critical thinking in Control Class	20	1.228	0.098	Normal

Based on Table 3. it is known that the sig value generated on the variable of students' scientific literacy skill and critical thinking skill is higher than 0.05, so it is accepted which means that the data is normally distributed.

b) Homogeneity Test

A homogeneity test is performed to determine whether the research data to be analyzed has the same variance in each independent category or not. The hypothesis used in the homogeneity test is

H_0 : the data variant are homogeneous

H_1 : the data variant are not homogeneous

The data are homogeneous when the resulting sig value is > 0.05. The results of the homogeneity test can be seen in Table 4.

Table 4. Pretest Data Homogeneity Test Results

Pretest Data	Levene Statistic	Sig.	Means
Scientific Literacy	3.728	0.061	Homogeneous
Critical Thinking	0.399	0.531	Homogeneous

Based on Table 4, it is known that the sig value generated in the students' variable literacy and critical thinking > 0.05 is accepted which means that the data variant is homogeneous.

Final Stage Analysis

Analysis of the initial stages of this study use posttest data on students from both the control and experimental classes. The analysis is carried out by conducting a normality test and a homogeneity test on the posttest data.

a) Normality Test Results

Normality test is performed to determine whether the posttest data are normal. The scientific literacy and critical thinking skills of students obtained in the study. The hypothesis used in the normality test is.

H_0 : data are normally distributed

H_1 : data are not normally distributed

Data is said to be normally distributed if the resulting sig value > 0.05. The results of the normality test can be seen in Table 5.

Table 5. Posttest Data Normality Test Results

Data Pretest	N	Kolmogorov-Smirnov	Sig. (2-tailed)	Means
Scientific Literacy in Control Class	21	1.062	0.210	Normal
Scientific Literacy in Experiment Class	20	0.841	0.480	Normal
Critical Thinking in Control Class	21	1.167	0.131	Normal
Critical Thinking in Experiment Class	20	1.002	0.268	Normal

Based on Table 5, it is known that the value of sig. (2-tailed) on the variable of students' scientific literacy and critical thinking skills in the experimental class and the control class > 0.05, which means that the data is normally distributed.

b) Homogeneity Test

The hypothesis used in the homogeneity test is:

H_0 : Data variants are homogeneous

H_1 : Data variants are not homogeneous

The data are homogeneous when the resulting sig. value is > 0.05. The results of the homogeneity test can be seen in Table 6.

Table 6. Posttest Data Homogeneity Test Results t

Pretest Data	Levene Statistic	Sig.	Means
Scientific Literacy	1.086	0.304	Homogeneous
Critical Thinking	0.042	0.838	Homogeneous

Based on Table 6, it is known that the sig. value in the variable of scientific literacy and critical thinking skills > 0.05 is accepted which means that the data variant is homogeneous.

The Effectiveness Test Results of PBL Assisted by Digital Storytelling Media to Improve Students' Science Literacy.

a) Data Analysis of the Completeness Test

In the experimental class, the students' scientific literacy skills in the experimental class, 20 students do not pass the Pretest data, but after being treated by using a PBL learning model assisted by digital storytelling media students who pass the posttest reached 18 students, there only 2 students who do not pass the posttest. From the list of standard normal tables, the result $-z_{0,5}$ or z_{table} -1.645. Because $Z_{count} > Z_{table}$ or 1.549 > -1.645 then H_0 is rejected so that it can be concluded that the proportion of experimental class students in the scientific literacy skills that meets the minimum completeness criteria, 7, it reaches more than 75%.

In the control class, 21 students who previously do not pass the test at pretest, but after being taught by using the learning method with the PBL model, there are 5 students who do not pass and 16 other students pass on posttest data. Based on the standard normal table list, the result is $-z_{0,5}$ or Z_{table} equal to -1,645. Since $Z_{count} > Z_{table}$ or 0.126 > -1.645, H_0 is rejected so that it can be concluded that the proportion of control class students in students' scientific literacy skills with the Problem Based Learning (PBL) model also meets the minimum completeness criteria,7 , reaching more than 75%.

From the two results of the completeness test, it can be proven that the use of PBL learning models using digital storytelling media is more effective to improve students' scientific

literacy skills than only using PBL learning models. This can be seen from the proportion of the results of the completeness of the experimental class is higher than the control class, the experimental class reaches the minimum completeness criteria, and so does the control class.

b) Data Analysis by Using the N-Gain Test

The N-gain test is conducted to see the difference in the students' pretest and posttest scores in the control class and the experimental class. The average N-gain in the data literacy skills of the experimental class and control class students is in the medium category with a score of 0.65 for the experimental class and 0.50 for the control class. The average N-Gain in the critical thinking skills data of the experimental class and control class students is in the medium category with a score of 0.67 for the experimental class and 0.51 for the control class.

Although the results of the N-Gain test are equally from the medium category, the results from the experimental class higher than the control class can prove that the use of PBL learning models using digital storytelling media is more effective to improve students' scientific literacy skills than only using PBL learning models.

c) Data Analysis of the Independent t-test

It is known that the significant value for students' scientific literacy skills is 0.003. Since 0.003 < 0.05, H_0 is rejected and means that there are differences in the average improvement in students' literacy skills in learning using PBL models assisted by digital storytelling media and PBL models. The students' scientific literacy skills in the experimental class reach 8.43; it is higher than the average of students' scientific literacy skills students in the control class which is only 7.57. It also proves that the use of PBL learning models assisted by digital storytelling media is effective for improving science literacy skills.

Effectiveness of PBL Assisted by Digital Storytelling Media to Improve Students' Critical Thinking Skills

a) Data Analysis of the Completeness Test

In the aspect of students' Literacy skill, 20 students in experiment class do not pass the Pretest data, but after being taught a PBL learning model assisted by digital storytelling media, there are 17 students who pass the Posttest data and 3 students do not pass. From the standard normal tables, it is obtained results $-z_{0,5}$ or z_{table} equal to -1,645. Since or z_{count} > z_{table} or 1.033 > -1.645, H_0 is rejected so that it can be concluded that the proportion of experimental class students in the students' critical thinking skills with PBL learning models assisted by digital storytelling media that meets the minimum completeness criteria, 7, reaching more than 75%.

In the control class, 21 students who previously do not pass the test at Pretest, but after being taught by using the learning method with the PBL model, there are 6students who do not pass and 15 other students pass on posttest data. Based on the standard normal table list, the result is $-z_{0,5}$ or Z_{table} equal to -1,645. Because $Z_{count} > Z_{table}$ or 0.126 > -1.645, H_0 is rejected so that it can be concluded that the proportion of control class students in students' scientific literacy skills with the Problem Based Learning (PBL) model also meets the minimum completeness criteria ,7, reaching more than 75%.

Based on the data analysis it can be concluded that the PBL learning model using digital storytelling learning media is more effective in improving critical thinking skills than using the PBL learning model, it can be seen from the difference in the proportion of completeness test results, the experimental class reaches z = 1.033, while the control class reaches z = 0.126.

b) Data Analysis of the N-gain Test

The results the average N-gain in the critical thinking skills data of the experimental class and control class students is in the medium category with a score of 0.67 for the experimental class and 0.51 for the control class. Because of the difference in the average N-Gain in the critical thinking skills data of the experimental class and the control class, it can also prove that in this study the use of digital

storytelling media is effectively used to improve critical thinking skills, even though the results of the control class are higher than the experimental class.

c) Data Analysis of the Independent t-Test

For students' critical thinking skills, it is known that the Sig. value for the independent t-test is 0.047. Since 0.047 < 0.05, H_0 is rejected, which means that there are differences in the average improvement in students' students' scientific literacy skills in learning using PBL learning models assisted by digital storytelling media and PBL learning models. While the average of critical thinking skills of the experimental class students is 8.20; it is higher than the average of students' critical thinking skills of the control class, 7.43. This also proves that the use of PBL learning models assisted by digital storytelling media is effective in improving literacy skills.

These results are also supported by the results of the questionnaire results. Overall, the fifth-grade students of State Elementary School 2 Tigajuru (experimental class) after receiving treatment using PBL learning models assisted by digital storytelling media in science learning, there are 80% of students who feel they have the scientific literacy and critical thinking skills in the Good category and 20% of students have Very Good skills. Unlike the State Elementary School 2 Kuanyar (control class) after learning with the PBL learning model, 14.29% of students feel they have the scientific literacy and critical thinking skill in the Fair category, 71.43% of students in the Sufficient category and 14.29% students in the Very Good category. Data from student responses are displayed.

From the recapitulation of the results of observations made, the observer also proved that the application of PBL learning models assisted by digital storytelling media in science learning during the research process can improve scientific literacy and critical thinking skills better than using PBL learning models. The results of the observation of the experimental class from the first meeting to the fourth meeting, it has higher results than the experimental class.

Based on the posttest results of the control class's scientific literacy skills in the aspects of science as the body of knowledge, the score is lower than that of other aspects, it means the skills of students to identify scientific facts, apply theories to solve problems, make hypotheses and explain the information obtained is lower when compared with other scientific literacy skills, while the results of the posttest science literacy skills in the experimental class from all aspects are good. The posttest results of the critical thinking skills of the control class on the indicator of the skills to give reasons to obtain lower scores compared to other critical thinking skills, while the results of the posttest of critical thinking in the experimental class from all aspects are good but there are two indicators namely providing a simple explanation and the skill to provide the reason, obtain unfavorable results. This is used as a basis for the researcher in interviews for both the control class and the experimental class.

Interviews are conducted to find out the causes and constraints experienced by students during the learning process. Interviews in both the control class and the experimental class are conducted on six students as a sample. The researcher takes two students who have scientific literacy skills and high critical thinking, two students have medium skills and two students have low skills.

From the interview data indicate that the cause of the low aspects of literacy and indicators of critical thinking skills due to the skill of students to understand the contents of reading is still low, students are lazy to read, and have a lack of confidence. These constraints can be overcome by motivating students to be diligent in reading books, often training students' skills to understand reading, as well as giving awards to students who have a predicate of very high skill in class.

The results of interviews with educators convinced that the use of PBL learning models and media is very suitable to be used to improve students' scientific literacy skills and students' critical thinking skills, even though at the beginning of the implementation, there are

obstacles because students are not familiar with the activities to solve their problems, and can not understand what they read well, as time goes on, students become independent, they can solve their problems. Students also become more challenged to express their opinions both verbally and written, and the level of mastery of student concepts improves so that student learning outcomes also improve. Student motivation in following the lessons also improved.

Furthermore, the use of attractive learning media also greatly influences success in the learning process. This is proven by the better results in the experimental class than in the control class. This is in accordance with the opinion of Arslan et al. (2014), which states that the use of digital storytelling media can improve students' understanding of abstract knowledge. Lisenbee & Ford (2017) added that digital storytelling media is a literacy tool that has the skill to build student knowledge from real-world experience. Tunç (2017) also added that the use of digital storytelling-based teaching materials can make students able to develop communication learning skills and increase student interest in learning activities.

Rahayuni (2016) states that there is a relationship between critical thinking skills and quite strong scientific literacy, having a pattern of "positive or unidirectional" relationships. This positive relationship can be interpreted that the higher the critical thinking skills of students, the higher the value of students' scientific literacy. From these statements, it can be interpreted that critical thinking skills are one of the cognitive factors that influence the ability of scientific literacy. If the critical thinking skills possessed by students are good, then their scientific abilities will be good. Therefore, if the scientific literacy ability is developed automatically, the educator will also improve critical thinking skills.

CONCLUSION

Based on the results of research and discussion that has been conducted, it can be concluded that science learning using PBL learning models assisted by digital storytelling media is effective in improving students' scientific literacy skills and students' critical thinking because it successfully meets the minimum completeness criteria of 7 with an achievement of more than 75%, N-Gain test results of the experimental class is higher than the control class and the results of the post-test mean score of the experimental class are higher than the control class. To improve students' scientific literacy and critical thinking skills, educators should improve students' ability to understand the contents of reading in advance, improve their motivation to take lessons, and train students to improve their courage. Facilitating all activities carried out by students is also one of the keys to success in implementing learning.

REFERENCES

Aiman, U., Dantes, N. , & Suma, K. (2019). Pengaruh Model Pembelajaran Berbasis Masalah terhadap Literasi Sains dan Berpikir Kritis Siswa Sekolah Dasar. *Junal Ilmiah Pendidikan Citra Bakti*, *6*(2), 196–209. https://doi.org/10.5281/zenodo.3551978

Alita, K.U., Koeswati, H.D., & Giarti, S. (2019). Penerapan Model Problem Based Learning untuk Meningkatkan Kemampuan Berpikir Kritis Siswa Kelas V SDN Ledok 5 Tahun Pelajaran 2018/2019. *Junal Basicedu*, *3*(1), 169–173.

Ardianto, D. &, & Rubini, B. (2016). Comparison of students' scientific literacy in integrated science learning through model of guided discovery and problem based learning. *Jurnal Pendidikan IPA Indonesia*, *5*(1), 31–37. https://doi.org/10.15294/jpii.v5i1.5786

Arslan, P. Y., Robin, B. R., & McNeil, S. (2014). Educational Uses of Digital Storytelling Around the World. *ResearchGate*, *1*(May 2014). Retrieved from http://www.olc.edu/~khecrow/webfolder/Research/SITE_DigitalStorytelling.pdf

Farisi, A., Hamid, A., & Melvina, &. (2017). Pengaruh Model Pembelajaran Problem Based Learning Terhadap Kemampuan Berpikir Kritis dalam Meningkatkan Hasil Belajar Siswa Pada Konsep Suhu dan Kalor. *Jurnal Ilmiah Mahasiswa (JIM) Pendidikan Fisika*, *2*(3), 283–287.

Fembriani, Khumaedi, Anni, C. T. (2015). Pengembangan Perangkat Pembelajaran IPA Model Learning Cycle 7E untuk Meningkatkan Kemampuan Bepikir Kritis. *Journal Of Primary Education*, *4*(1), 15–23.

Hindarto, N. (2015). Readiness of Elementary School Teachers in Implementing Characters Integrrated Learning In The Science Subject. *Jurnal Pendidikan Fisika Indonesia*, *11*(1), 36–41. https://doi.org/10.15294/jpfi.v11i1.4001

Karakoyun, F. &, & Yapıci, İ. Ü. (2016). Use of Digital Storytelling in Biology Teaching. *Universal Journal of Educational Research*, *4*(4), 895–903. https://doi.org/10.13189/ujer.2016.040427

Lisenbee, P. S. &, & Ford, C. M. (2018). Engaging Students in Traditional and Digital Storytelling to Make Connections Between Pedagogy and Children's Experiences. *Early Childhood Education Journal*, *46*(1), pp.129-139. https://doi.org/10.1007/s10643-017-0846-x

Mundzir, M.F., Sujana, A., & J. (2017). Problem-Based Learning Untuk Meningkatkan Kemampuan Literasi Sains Siwa SD. *Jurnal Pena Ilmiah*, *2*(1), 421–430.

Nadhifatuzzahro, D., B. Setiawan, & E. S. (2015). Kemampuan literasi sains siswa kelas VII-B SMP Negeri 1 Sumobito melalui pembuatan jamu tradisional. *Prosiding Seminar Nasional Jurusan Fisika FMIPA UM*, (pp.F1-F8). https://doi.org/Malang: Universitas Negeri Malang

OECD. (2019). PISA 2018 Results. *OECD*, *I,II & III*, 18.

Rahayuni, G. (2016). Hubungan keterampilan berpikir kritis dan literasi sains pada pembelajaran ipa terpadu dengan model PBM dan STM. *Jurnal Penelitian Dan Pembelajaran IPA*, *2*(2), 131–146.

Tunç, Ö. A. (2017). Material Development Based on Digital Storytelling Activities and Assessment of Students' Views. *International Journal of Evaluation and Research in Education*, *6*(1), 54–63. Retrieved from https://files.eric.ed.gov/fulltext/EJ1139361.pdf

Umaya, N.M., Suwandi, S., Budiyono, A. (2017). Local Stories Adapted as Learning Tools Innovation of Fairy Tale for Teacher to Improve the Literacy Skills of Student in Secondary Schools. *International Journal of Pedagogy and Teacher Education (IJPTE)*, *1*(1), 63-72. https://doi.org/10.20961/ijpte.v1i1.8396

Wilsa, A.W., Susilowati, S.M.E., & Rahayu, E. S. (2017). Problem Based Learning Berbasis Socio-Scientific Issue untuk Mengembangkan Kemampuan Berpikir Kritis dan Komunikasi Siswa. *Journal of Innovative Science Education*, *6*(1), 129-138.

Wiyanto, Nugroho, S.E., & H. (2017). The Scientific Approach Learning: How prospective science teachers understand about questioning. *Journal of Physics: Conference Series*, *824*(1), 012015.

Wiyanto & Widiyatmoko, A. (2016). Preparation Model of Student Teacher Candidate in Developing Integrative Science Learning. *Journal of Education and Human Development*, *5*(2), 169–177.

Wulandari, T., Kadir, A., Fua, J.L., & Z. (2020). Pengaruh Model Problem Based Learning Berbasis Multimedia Terhadap kemampuan Berpikir Kritis dan Hasil Belajar Siswa. *Kulidawa*, *1*(1), 29–34.

Yosepus, A., Hallatu, Prasetyo, K. (2017). Pengaruh Model Problem Based Learning terhadap Kompetensi Pengetahuan dan Keterampilan Berpikir Kritis Siswa Madrasah Aliyah BPD IHA Tentang

Konflik. *Jurnal Penelitian Pendidikan*, *34*(2), 183–190.

Yuliati, Y. (2017). Literasi Sains dalam Pembelajaran IPA. *Jurnal Cakrawala Pendas Vol. 3 No.2 Edisi Juli 2017*, *3*(2), 21–28.