

THE EFFECT OF THE READ, ANSWER, DISCUSS, EXPLAIN, AND CREATE LEARNING MODEL BASED ON AN STEM APPROACH ASSISTED BY AUTOGRAPH ORIENTED TO STUDENTS' MATHEMATICAL LITERACY ABILITY

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ABSTRACT

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The purpose of this study was to determine whether there is an influence in the application of the STEM-based Read, Answer, Discuss, Explain, and Create (RADEC) learning model assisted by the Autograph application oriented to the mathematical literacy skills of ninth-grade students. The type of research used was Pre-Experimental with one pretest-posttest design. The population in this study was all grade IX. The approach used in this research is Science Technology Engineering and Mathematics (STEM). The research design used was pre-experimental with a one-pretest-posttest design. The sample in the study only used 1 class, namely class IX^a, sampling using purposive sampling. Before being given treatment on the learning model and the ability, students were given an initial ability test (pretest), which obtained an average value of 68.23. Then, students will be given treatment in the form of learning by applying the STEM-based Read, Answer, Discuss, Explain, and Create (RADEC) learning model assisted by the Autograph application oriented to students' mathematical literacy skills. After the learning was completed, the final ability test (posttest) was given so that the posttest value was obtained with an average of 85.55. Furthermore, the T-test results show that t_{count} is 11.330 and t_{table} at significance $\alpha = 0.05$ is 1.68, so that $t_{count} > t_{table}$ ($11.330 > 1.68$), which means that H_0 is rejected and H_1 is accepted. Thus, it is obtained that there is an effect of the STEM-based Read, Answer, Discuss, Explain, and Create (RADEC) learning model assisted by the Autograph application oriented to students' mathematical literacy skills in class IX^a.



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1. INTRODUCTION

Education plays a vital role in increasing Human Resources (HR). There are demands in developing student skills in 21st-century education, especially in thinking ability. Along with the current rapid advances in science and technology, students are able to identify problems and create solutions to solve these problems [1]. Life in the 21st century itself is inseparable from the problems that exist in everyday life. The problems faced by humans are increasingly complex, so they are in line with the development and challenges of the times. This can result in humans being required to have more than high competence to solve problems and meet the demands of the era. In the Industrial Revolution 4.0, education was influenced by the characteristics of education, which emphasizes the use of digital technology (*cyber system*) in the learning process in class. [2]. Furthermore, the Era of *Society 5.0*, according to [3], is a term that can be used to describe the next step in the development of society in integrating digital technology and artificial intelligence in all aspects of life.

In the current era of development, people are expected to be able to adapt and adjust to technology that is increasingly developed and has a significant impact on a person's way of life both in work and communication in everyday life. With the use of digital technology, the learning process may take place not limited to space and time, which is not only in the classroom but also during study hours. However, in reality, the application of technology in the field of education in Indonesia is in an intermediate position; it can be seen that technology itself still needs to be fully utilized [4]. This is especially true in math learning, which is always considered difficult by students. Mathematics is an essential subject in human life; mathematics plays a role in almost all aspects, even in today's technological and digital times. This is in line with (Minister of Education and Culture Regulation) Permendikbud number 21 of 2016 concerning Graduate Competency Standards for junior/senior high school that should have factual, conceptual, and procedural knowledge and be able to relate to various contexts [5]. This is aligned with mathematics as a science that requires understanding, not just memorization, starting from simple concepts to very complex concepts in learning to understand and master concepts in mathematics. After understanding the concept, it can then be applied in everyday life by applying a description of the mathematical concept. This can be associated with numeracy literacy skills, also known as mathematical literacy [6]. Mathematical literacy, according to [7], is an individual's ability to be able to formulate, apply, and interpret mathematics learning in various contexts. In this case, it includes mathematical reasoning in the use of mathematical concepts, procedures, facts, and mathematical tools in describing, explaining, describing, and predicting phenomena/events. The academic quality between nations through the *Program for International Student Assessment (PISA)* in the field of Mathematics 2018 released by the OECD shows that Indonesian students, in terms of reading, achieved an average score of 371 from the OECD average score of 487 [8].

Furthermore, from the PISA test results you can explore various more complex solutions, you can think critically and you can communicate effectively. Looking at mathematical literacy abilities according to [9], which has been released is related to aspects of mathematical literacy. Based on these results, Indonesia's PISA 2022 results are lower than in previous years. These results show that the mathematics score is 366, which is still below the OECD average. Consisting of 18% of the student sample in Indonesia, they are still at level 2, much lower than the OECD average of 69%. Furthermore, there are almost no top-performing students at level 5 and also level 6 on the PISA mathematical literacy test. These results indicate that students' mathematical literacy skills in Indonesia are still low on an international scale.

This is supported by research conducted by [10] that the *Problem-Based Learning (PBL)* learning model based on *Science, Technology, Engineering, and Mathematics (STEM)* can improve students' numeracy literacy skills in class VIII¹ MTs Al-Arifin Rahuning. The increase in these abilities can be seen from the average value of students in the pre-cycle test, which is (50.67%), then in cycle I, which is (69.64%) and in cycle II which is (78.75%). The same research was conducted by [11] that aims to train and find the skills of problem-solving from the application of the *Science, Technology, Engineering, and Mathematics (STEM)* approach by using a problem-based learning model on the object of rotational dynamics using *quasi-experiment* with the research design used, namely *one group pretest-posttest* using the population of one of the schools in Bandung with a sample of 30 students obtained randomly. The research instruments used were 24 essay tests of problem-solving skills with a validity of 0.6 and a validity of 0.7; then, the results of the research obtained were an increase in several aspects of problem-solving skills and analysis of effectiveness through the value of the normalized gain. Furthermore, research conducted by [12] suggests that the outcomes of student literacy tests using the Problem-Based Learning (PBL) model with a Realistic Mathematics Education (RME) approach assisted by Schoology on quadrilateral topics achieve classical proficiency. The mathematical literacy skills of students using PBL with the RME approach assisted by Schoology are superior

to those using conventional teaching models. The improvement in students' mathematical literacy skills with the PBL model using the RME approach assisted by Schoology is higher compared to the literacy skills of students using conventional teaching models.

The same thing can be found at the Public Junior High School 10 Yogyakarta; it can be seen in students' mathematical literacy skills in solving mathematical literacy problems. The problem-solving of one of the students at junior high school is good, but based on several indicators that exist in mathematical literacy skills several indicators still need to be achieved. One of them is that students have yet to be able to formulate the problem of the available quadratic equation into the form of coordinate points systematically so that the resulting curve is not maximally formed. This can have an impact on the following few literacy indicators, namely in applying concepts and interpreting the results of solutions in the context of actual forms. From an interview conducted by one of the teachers who teach at Public Junior High School 10 Yogyakarta, the factors that influence the lack of mathematical literacy skills at the school include learning that was previously carried out has not been carried out optimally so that students have not fully digested the learning delivered by the teacher. In addition, teachers still need to fully include indicators that measure mathematical literacy in the learning process in the classroom. In other words, the mathematics learning process applied at the school has not been able to make students have the habit of reading while thinking and working, as can be seen from the examples and practice problems used that are directly focused on the given mathematical formulation so that when students are faced with literacy problem exercises, students have not been able to answer questions accurately and well.

These factors make researchers feel the need to provide a learning experience in a more interactive and fun way. They can include learning activities that link to mathematical literacy as an essential point, namely by using the *Read, Answer, Discuss, Explain, and Create* (RADEC) learning model based on the *Science, Technology, Engineering, and Mathematics* (STEM) approach with the help of the *Autograph* application. In line with the situational vision of the school that provides a wide range of ways of learning for teachers and students and integrates with the use of technology, the use of the STEM-based *Read, Answer, Discuss, Explain, and Create* (RADEC) learning model assisted by the *Autograph* application is the right solution to use. The *Read, Answer, Discuss, Explain, and Create* (RADEC) learning model is a learning model that uses its stages as the name of the model itself, namely *Read, Answer, Discuss, Explain, and Create*.

The *Read, Answer, Discuss, Explain, and Create* (RADEC) learning model is the answer to teachers' misconceptions about innovative learning models [13]. In addition, the syntax is easy to memorize, and this model does not take a long time to implement in the classroom. The advantages of *Read, Answer, Discuss, Explain, and Create* (RADEC) according to [14] namely: 1) Teachers can design models that make the learning process much more interesting; 2) Students' critical thinking skills can be improved; 3) Analysis of students and reading skills can be improved; 4) More collaboration in groups, the advantages of *Read, Answer, Discuss, Explain, and Create* (RADEC) are in the syntax that the teacher quickly understands. Based on the results of research conducted by [15], in addition to the model applied in the learning process, the application of exciting media can also generate student interest and excitement. One of the learning media that is interesting and increases student activity is using technology. One approach that can be applied to overcome the problem of low mathematical literacy skills in the *Read, Answer, Discuss, Explain, and Create* (RADEC) model is *Science Technology Engineering and Mathematics* (STEM). STEM is designed to be able to develop various skills in the 21st century that can be used in all fields in everyday life, such as reasoning, problem-solving, critical thinking, creative thinking skills and investigation, independent learning, literacy in technology, teamwork and collaboration, and various other related skills. Efforts to improve students' mathematical literacy skills include better quality learning through good learning media used by students so that it can help students understand and master mathematical learning materials well [16]. *Science, Technology, Engineering, and Mathematics* (STEM) is also an approach that helps students solve problems better, have independent innovation, and have logical thinking so that the STEM approach can be applied to learning in this era. The STEM approach itself can help students and teachers solve learning problems [17].

This STEM-based RADEC learning model will be more suitable for schools with the assistance of the *Autograph* application, where the *autograph* is one of the most effective and efficient learning tools in computer utilization in terms of supporting the quality of learning in the classroom. According to [18], the *autograph* application can contribute to increasing student motivation in learning mathematics. Furthermore, that this *autograph* application is very good at visualizing geometry because it has 2D and 3D graphics capabilities for topics such as transformations, conic sections, vectors, slopes, and integral and derivative applications. In line with this, the quadratic equation material will be reviewed further by researchers and students by applying the STEM-based RADEC learning model assisted by the *Autograph* application.

According to information provided by the subject teacher, the quadratic equation material in class IX is one of the problematic materials for students, so it has an impact on the next sub-material.

2. RESEARCH METHODS



The type of research used is quantitative research, namely research by carrying out systematic investigations in examining a phenomenon by collecting data. The research method used in this research is the *pre-experimental* method, which uses one class as the experimental class. The research design used was the *One Group Pretest-Posttest Design* [19]. The research instrument used was a mathematical literacy ability test sheet. However, the test instruments used need to be tested for quality using validity and reliability tests, distinguishing power tests, and difficulty level tests. In this design, students were previously given a *pretest*, then after being given a *pretest*, they will then be given treatment, namely, the application of the STEM-based *Read, Answer, Discuss, Explain, and Create* (RADEC) learning model with the assistance of the *Autograph* application. The data analysis technique used is the normalized gain test. After the increase in mathematical literacy skills is known, then look for the influence that causes mathematical literacy skills to increase by looking for the effect of implementing the STEM-based RADEC learning model. The data analysis used is the normality test and homogeneity test.


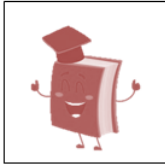

Furthermore, after being given treatment by applying the learning model, students were given a *posttest* to determine their' Mathematical Literacy Skills. The population in this study were all students of Public Junior High School 10 Yogyakarta, and the sample taken from the population must be truly representative. Therefore, the sampling technique used was *Purposive Sampling*, namely class IX^a. Based on interviews that have been conducted with mathematics teachers at school, IX^a is the most active class in both academic and non-academic fields. Based on interviews conducted with mathematics teachers at school, class IX^a is the most active class in both academic and non-academic fields.

3. RESULTS AND DISCUSSION

Data collection on the *pretest* was carried out before the learning activity process in the sample class. The *pretest* was given to determine the initial ability of students' mathematical literacy before being given treatment with the RADEC (*Read, Answer, Discuss, Answer and Create*) learning model based on the *Science Technology Engineering and Mathematics* (STEM) assisted by the *Autograph* application. Furthermore, the *posttest* was conducted to determine the final ability of students' mathematical literacy after being given treatment with the RADEC (*Read, Answer, Discuss, Answer, and Create*) learning model based on *Science, Technology, Engineering, and Mathematics* (STEM) assisted by the *Autograph* application. The tests given to students were in the form of *essay tests* consisting of 5 questions for *pretest* and *posttest*. The STEM approach used in this research can be seen in the following **Table 1**:

Table 1. STEM Learning Process

No	STEPS
1	<p>Science</p> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;">  <p>READ</p> <ul style="list-style-type: none"> • Seek and read information to answer pre-learning questions • Read the questions and commands in LKPD 1 </div> <div style="margin-right: 20px;"> <p>ANSWER</p> <ul style="list-style-type: none"> • Answer the questions provided in LKPD 1 • Fill the available columns with the proper answers </div> <div style="text-align: center;">  </div> </div>

No	STEPS
2	<p><i>Technology</i></p> <p>DISCUSS</p>  <ul style="list-style-type: none"> • Discuss with Groupmates • Discuss and find the proper answer to fill LKPD 1 • Explore using the Autograph application
3	<p><i>Engineering</i></p> <p>EXPLAIN</p> <ul style="list-style-type: none"> • Explain the answers obtained in the discussion • Answer classmates' questions • Conduct a project related to the issue 
4	<p><i>Mathematics</i></p> <p>CREATE</p>  <ul style="list-style-type: none"> • Create ideas in finding the solution of the question • Calculate the solution of the given problem • Present the created ideas to classmates

The following are the results of the analysis of the number of students who answered each item from the *pretest*, with the scores obtained by students presented in **Table 2** below.

Table 2. The Number of Students who Answered the *Pretest* Questions, Along with The Obtained Score

The number of students who answered the *pretest* questions, along with the acquisition score per question item

No. About	Question score			
	2	4	6	12
1	10 students	8 students	3 students	1 student
2	7 students	7 students	5 students	3 students
3	12 students	3 students	6 students	1 student
4	9 students	6 students	7 students	-
5	13 students	3 students	3 students	3 students

Based on the results of the *pretest* scores of students who answered the questions, they were tabulated and arranged in **Table 3** as follows using *SPSS Statistics 25*.

Table 3. Tabulation of Students' *Pretest* Scores

		Statistic	Std. Error	
PRETEST	Mean	68.23	1.301	
	95 % Confidence Interval	Lower Bound	65.52	
	For Mean	Upper Bound	70.93	
	5% Trimmed Mean		68.41	
	Median		69.50	
	Variance		37.232	
	Std. Deviation		6.102	
	Minimum		56	
	Maximum		77	
	Range		21	
	Interquartile Range		8	
	Skewness		-.548	.491
	Kurtosis		-.487	.953

Based on the results of calculations on *SPSS Statistics 25* in **Table 3**. Then, the data found in the form of the average value of students is 68.23, the standard deviation is 6.102, the variance is 37.232, the lowest score obtained by students is 56, and the highest score obtained by students is 77. The *posttest* was conducted to determine students' mathematical literacy skills after being treated with the STEM-based RADEC learning model assisted by the *Autograph* application. The test given was in the form of *essay* questions consisting of 5 questions.

The *posttest* was given to determine students' mathematical literacy abilities after being treated with the STEM-based RADEC model assisted by the *Autograph* application. The test given is in the form of an *essay* consisting of 5 questions. The following is an analysis of the number of students who answered each *posttest* question item with the scores obtained by the students.

Table 4. Number of Students Who Answered the *Posttest* Questions Along with The Obtained Score

Number of students who answered the <i>posttest</i> questions along with the acquisition score per question item				
No. About	Question score			
	2	4	6	12
1	12 students	6 students	3 students	1 student
2	9 students	7 students	3 students	3 students
3	10 students	4 students	5 students	4 students
4	9 students	6 students	2 students	2 students
5	9 students	6 students	3 students	4 students

Based on the results of the *posttest* scores of students who answered the questions, they were tabulated and arranged in **Table 5** as follows using *SPSS Statistics 25*.

Table 5. Tabulation of Students' *Posttest* Scores

		Statistic	Std. Error
POSTTEST	Mean	85.55	.802
	95 % Confidence Interval For Mean		
		Lower Bound	83.88
		Upper Bound	87.21
	5% Trimmed Mean	85.49	
	Median	85.50	
	Variance	14.165	
	Std. Deviation	3.764	
	Minimum	80	
	Maximum	92	
	Range	12	
	Interquartile Range	7	
	Skewness	.125	.491
Kurtosis	-.968	.953	

Based on the results of calculations using *SPSS Statistics 25* in **Table 5**, the average student score is 85.55. The standard deviation is 3.764. The variance is 14.165. The lowest score obtained by students is 80, and the highest score obtained by students is 92.

After the data was obtained, the analysis requirements test was carried out in the form of a normalized gain test using the normality test and homogeneity test.

3.1 Nominalized Gain Test

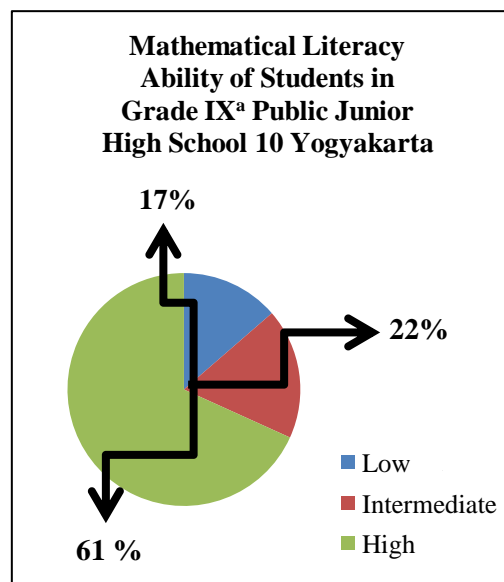
The normalized gain test was intended to determine the improvement of students' mathematical literacy skills that have been obtained from *pretest* and *posttest* data. This was done because there was only one sample being analyzed, so it was not to be compared but to see the increase in ability alone and to find out the results of the increase obtained by students, namely by calculating the gain.

To find out the results of the improvement obtained by students, namely by calculating the gain. Gain is the difference in scores during the *pretest* and *posttest* in **Table 6** below.

Table 6. Gain pretest and posttest scores

Student	Pretest Score	Posttest Score	Gain
A-1	56	87	31
A-2	72	92	20
A-3	67	87	20
A-4	58	82	24
A-5	70	89	19
A-6	68	86	22
A-7	76	90	14
A-8	70	86	16
A-9	69	80	11
A-10	58	85	27
A-11	65	90	25
A-12	70	83	13
A-13	75	80	5
A-14	67	87	20
A-15	72	82	10
A-16	74	80	6
A-17	76	83	13
A-18	68	82	14
A-19	62	89	27
A-20	70	85	15
A-21	61	92	31
A-22	77	85	8

The determination of the normalized gain refers to the diagram on the interpretation scale, as shown in **Figure 2**.

**Figure 2.** Normalized Gain Interpretation

Based on **the Figure 2** diagram above, it can be seen that the interpretation scale of mathematical literacy skills of students in class IXª Public Junior High School 10 Yogyakarta is a low ability student of about 17%, then a medium ability student of about 22% and a high ability student of about 61% of the total number of students in class IXª.

3.2 Normality Test

The normality test intended here was to determine whether the data was normally distributed or not. This data normality test used the *Shapiro-Wilk* test with $n = 22$ and a significance level of 0.05. Based on the results of data analysis with the assistance of applications on *SPSS Statistics 25*, the data in **Table 7** are obtained as follows.

Table 7. Results of Pretest-Posttest Data Normality Test of Normality

	<i>Kolmogorov-Smirnov^a</i>			<i>Shapiro Wilk</i>		
	<i>Statistic</i>	<i>df</i>	<i>Sig.</i>	<i>Statistic</i>	<i>df</i>	<i>Sig.</i>
PRETEST	.148	22	.200*	.939	22	.189
POSTTEST	.114	22	.200*	.948	22	.290

The results of calculations using the *SPSS Statistics 25* application are in **Table 7**. shows that the *pretest* value obtained the significance value (p) in the *Kolmogorov-Smirnov test* is 0.2 where ($p > 0.05$), so based on the *Kolmogorov-Smirnov* normality test, the data is obtained normally distributed. While the significance value (p) in the *Shapiro-Wilk test* is 0.189 where ($p > 0.05$), based on the *Shapiro-Wilk* normality test, the data is normally distributed. The same thing to the *posttest* value; the significance (p) obtained in the *Kolmogorov-Smirnov test* is 0.2 where ($p > 0.05$), so based on the *Kolmogorov-Smirnov* normality test, the data is found to be normally distributed. Meanwhile, the significance value (p) in the *Shapiro-Wilk test* is 0.290 where ($p > 0.05$), so based on the *Shapiro-Wilk normality test*, the data is normally distributed.

3.3 Homogeneity Test

The homogeneity test aimed to determine whether the *variance of the scores* measured in the two samples had the same variance or not. To calculate the homogeneity of variance in *pretest* and *posttest* data, calculations using *SPSS Statistics 25* are presented in **Table 8** as follows.

Table 8. Results of Homogeneity Test for Pretest and Posttest Data Test of Homogeneity of Variance

	<i>Levene Statistic</i>			
		<i>df₁</i>	<i>df₂</i>	<i>Sig.</i>
<i>Pretest score</i>	.419	1	22	.525
<i>Posttest score</i>	.093	1	22	.764

In **Table 8**, calculations using the *SPSS Statistics 25* application show the *pretest* value that the *sig* value $> \alpha = 0.05$. Then $F_{count} < F_{tabel}$ obtained a *sig* value = 0.525, and on the *posttest* value obtained a *sig* value = 0.764. Therefore, it can be concluded that H_0 is accepted, meaning that the data from the student math literacy test have the same variance.

3.4 Hypothesis Test

Hypothesis testing was carried out using the *t*-test through the equation of the average two-party test, namely on the right side. Thus, the statistical hypothesis is as follows:

$H_0 : \mu_1 = \mu_2$	There is no significant effect of the STEM-based <i>Read, Answer, Discuss, Explain, and Create</i> (RADEC) learning model on students' mathematical literacy skills on quadratic equation material in class IX ^a Public Junior High School 10 Yogyakarta.
$H_1 : \mu_1 \neq \mu_2$	There is a significant effect of the STEM-based <i>Read, Answer, Discuss, Explain, and Create</i> (RADEC) learning model on students' mathematical literacy skills on quadratic equation material in class IX ^a Public Junior High School 10 Yogyakarta.

Table 9. Hypothesis Test Results of *Pretest* and *Posttest* Data One-Sample Test

	Test value = 0						
	T	df	Sig. (2-tailed)	Mean Difference	95 % Confidence Interval of the Difference		
					Lower	Upper	
<i>Pretest</i>	522.46	21	.000	68.227	65.52	70.93	
<i>Posttest</i>	106.612	21	.000	85.545	83.88	87.21	

Table 9. shows the t column, which is $t_{count} = 11.330$. Then, $t_{count} = 11.330 > t_{table} = 1.68$. Therefore, H_0 is rejected, and H_1 is accepted. This means that the STEM-based *Read, Answer, Discuss, Explain, and Create* (RADEC) learning model affects students' mathematical literacy skills.

The difference in the results of the *pretest* and *posttest* scores on the mathematical literacy skills of class IX students is presented in **Table 10**.

Table 10. The Differences in Students' Mathematical Literacy Skills

Test	Average	Category
<i>Pretest</i>	68,23	Sufficient
<i>Posttest</i>	85,55	Good

The results of this study reveal that there was an increase in students' mathematical literacy skills before and after being treated by applying the RADEC (*Read, Answer, Discuss, Explain, and Create*) learning model based on *Science, Technology, Engineering, and Mathematics* (STEM) by conducting a normalized gain test.

Next, normality and homogeneity tests were carried out, showing that the samples were normally distributed and there were no differences in variance. Based on the data on students' mathematical literacy abilities that have been obtained and the t -test results table, $t_{count} = 11.330 > t_{table} = 1.68$ so that H_0 is rejected and H_1 is accepted. This means that there is an influence of the STEM-based RADEC learning model on mathematical literacy skills in class IX^a of SMP Negeri 10 Yogyakarta. Based on the research findings that have been carried out, data was obtained that students at SMP Negeri 10 Yogyakarta, basically already have quite good literacy skills. This is supported by the presence of wall media in every classroom. Not only that, there are literacy activities that are also called for by the school principal to improve students' literacy skills. However, students' mathematical literacy skills cannot yet be said to be completely good. This is proven by the lack of attention of students in working on mathematical literacy skills questions. Based on interviews with teachers, it was found that the trigger factor for students' lack of attention in working on literacy questions was due to being accustomed to working on non-literacy questions or questions that were directly focused on the center of the problem. However, students' curiosity and enthusiasm in understanding mathematical literacy questions can be greatly appreciated. It was proven that during the STEM-based RADEC learning model assisted by the Autograph application, students were very enthusiastic and active in discussing, asking questions, and being creative. This can also be seen in the results of students' *posttest* scores which have increased from the results of the previous *pretest* scores. It can be said that students' mathematical literacy abilities have also increased.

4. CONCLUSIONS

Based on data analysis conducted, the following conclusions can be drawn: There is a significant effect of the STEM-based RADEC (*Read, Answer, Discuss, Explain and Create*) learning model on students' mathematical literacy skills in class IX^a Public Junior High School 10 Yogyakarta with the results of the initial ability test (*pretest*) with an average value of 68.23; standard deviation 6.102 and a variation of 37.232; then on the final ability test (*posttest*) with an average value of 85.55; standard deviation 3.764; and a variation of 14.165.

The *Shapiro-Wilk* test found a significant value of 0.189 where ($p > 0.05$) that implies normally distributed data. In the homogeneity test, the *pretest* value $F_{count} < F_{table}$ obtained a *sig* value = 0.525, and the *posttest* value obtained a *sig* value = 0.764. Therefore, the data concluded that H_0 is accepted, meaning that the data on the student mathematical literacy ability test has the same variance. Based on the analysis of the t -test, the t_{count} result is 11.330, and t_{table} at significance $\alpha = 0.05$ result is 1.68, so that $t_{count} > t_{table}$ ($11.330 > 1.68$), which means H_0 is rejected and H_1 is accepted.

The findings of this research show that using the Autograph application has higher test scores compared to students who only use school textbooks, the application used can help visualize difficult concepts and provide practice questions with direct feedback. Meanwhile, the limitation of this research is that it uses pre-experimental research which does not use randomization, which may have selection bias that influences the research results. Thus, for further research, it is necessary to develop methods for teaching mathematics that are more effective using digital technology, as well as using project-based learning that refers to understanding mathematical concepts at various levels of education.

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