The Effectiveness of Implementation Artificial Intelligence CANVA and Google Classroom in Problem Based Learning with the PMRI Approach to Improve Mathematical Literacy

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Abstract. The aim of this research is to find out whether the application of Artificial Intelligence (AI) Canva and Google Classroom in the Problem-Based Learning (PBL) model using the PMRI approach has good qualities for increasing students' Mathematical Literacy (ML). The research method used is a quantitative method using a quasi-experimental design with a pretest-posttest control group design. The population of this study was VIII A as the experimental class and VIII B as the control class. The results of the research show that at the learning planning stage it shows that the learning tools used in this research have been validated with very valid criteria, at the implementation stage the learning is carried out with very good criteria, and at the learning stage it is implemented. came out with very good criteria. At the learning evaluation stage, the results obtained were that students' mathematical literacy reached BTA, students completed classically, the proportion, average, and results of increasing mathematical literacy in the experimental class were higher than in the control class. Based on the analysis results, it shows that the application of AI Canva and Google Classroom in the PBL model using the PMRI approach has very good quality in improving students' Mathematical Literacy (ML).

Keywords: AI, CANVA, Google Classroom, Mathematical Literacy.

1. Introduction

Artificial Intelligence (AI) has become one of the greatest technological advances in the ever-evolving digital era. AI is not only changing the way we interact with technology but also expanding the learning space in many fields, including education, having the ability to process data quickly and understand complex patterns. AI-based learning is an approach that focuses on using AI to improve the learning process [1]. The aim of using AI is to create an intelligent learning environment that can adapt to the characteristics and needs of each student, and to improve the quality of education and student engagement [2]. AI analyzes big data, and the results will be returned to the physical area which is then used by the community.

In the industrial era 4.0, literacy is considered a need for every human being to fulfill their daily needs. literacy is an ability that emphasizes students' thinking processes in solving and being critical of problems in everyday life [3]. In Indonesia, literacy culture is still not optimal, it needs to be improved among the community. People in Indonesia tend to prefer watching cellphones with status updates and following television broadcasts rather than reading [4].

In order to improve literacy culture in schools, communities and families, the government created a National Literacy Movement policy through Minister of Education and Culture Regulation Number 23 of 2015 concerning character development [5].

One of the fundamental literacy skills that can be used in elementary school to college is mathematical literacy or numerical literacy. The capacity to process, understand and convey numerical information in various circumstances is known as numeracy literacy [6]. In the world of education, one of the mandatory subjects taught at every level of education is mathematics, because the benefits it has and obtains can be applied in various aspects of life. In learning mathematics, students not only need to have the ability to calculate, but also need to be able to reason logically and think critically to solve problems in every learning process. When solving this problem, we don't just focus on mathematical problems, but more on solutions related to problems that are often faced in everyday life. Based on this explanation, according to [7] this mathematical ability is called mathematical literacy. Mathematical literacy provides awareness

and understanding of the role of mathematics in the world [8]. Mathematical literacy is one of the abilities needed to face the challenges of the 21st century [9]. This is important because in the future, individuals will be faced with various challenges in solving various problems. In the process of communicating and explaining a phenomenon using mathematical concepts, students also need to have mathematical literacy. This shows that mathematical literacy is an individual's ability to formulate, use, and interpret mathematics in various contexts.

The Ministry of Education and Culture put forward three indicators of numeracy literacy, namely: 1) using various numbers and symbols related to basic mathematics in solving practical problems in the context of everyday life; 2) analyze information displayed in various forms (graphs, tables, diagrams, and so on); and 3) interpreting analysis results to predict and make decisions. The quality of students' numeracy literacy in Indonesia does not directly correlate with the importance of numeracy literacy for students. PISA results show that Indonesia is ranked 75th out of 80 countries with a score of 379 out of a maximum score of 500 [10]; [11]. These data illustrate that the achievements of Indonesian students, especially in the numeracy literacy aspect, are still far from satisfactory.

Using learning models that can motivate students to actively participate in their education, such as the PBL model, is one way to increase students' numeracy literacy. One effort to improve students' numeracy literacy is by using a learning model that can encourage students to actively participate in learning, such as implementing the PBL model. Students have the opportunity to actively participate in their education through problem-based learning [12]. Furthermore, the PBL model allows students to learn through real word problems, which encourages active learning, knowledge development, and an organic blend of classroom learning and real word learning, also giving students the opportunity to improve their learning activities and outcomes [13]. Mathematics learning that applies the PBL model has a positive impact in improving problem solving skills [14], mathematical reasoning abilities [15], and improving students' mathematical literacy abilities [16].

One approach that can help students understand, analyze and solve problems related to real life is PMRI. The Indonesian Realistic Mathematics Approach (PMRI) is an adaptation of RME [17]; [18]. PMRI learning begins by providing problems that are relevant to students' experience and knowledge, then the teacher acts as a facilitator to help students solve contextual problems [19]. The foundation of RME is the idea that student engagement with mathematics must begin in a meaningful context and develop through the development of mathematical representations and skills starting with formal reasoning [18].

In this era of advanced technological progress, information is developing very quickly. Learning via the internet or e-learning has the potential to produce fun and meaningful learning [20]. One e-learning that has features that support learning is Google Classroom. Google introduced Google Classroom in 2014 as an online learning platform with various effective, efficient and safe features [21].

Based on this background, this research was carried out with the aim of: 1) finding out the mathematical literacy of students who received PBL learning using the PMRI approach assisted by CANVA and Google Classroom and were able to achieve classical completion. (2) Knowing that the average mathematical literacy of students who receive PBL learning using the PMRI approach assisted by CANVA and Google Classroom is greater than the average mathematical literacy of students who receive discovery learning using a scientific approach. (3) Knowing that the average increase in mathematical literacy skills of students who receive PBL learning using the PMRI approach assisted by CANVA and Google Classroom is greater than the average increase in mathematical literacy of students who receive discovery learning with a scientific approach.

Improving the quality of mathematics learning can be done by using learning media that are good, effective, creative, interactive and attract the attention of students. One of the results of advances in AI technology which is currently an effective learning medium is the CANVA application [22]. In this modern era, CANVA is one of the best choices because it allows direct integration with AI. Many teachers choose CANVA because it provides a variety of image, video and audio templates, which can be used to create more interactive and engaging lessons. [23]

2. Literature Review

2.1   Artificial Intelligent CANVA

CANVA is an online design platform that provides a wide range of creative ideas, including poster designs, graphics, brochures, presentations, logos, videos, book covers, and more. CANVA allows users to connect with each other with social media [24]. The service categories provided by CANVA are free and paid [25]. CANVA can also be accessed for android and iOS version users. The use of graphic design tools on CANVA

can be used easily and quickly for the process of creating a variety of imaginative designs. See Picture 1 and Picture 2.

Picture 1. Main menu CANVA

A variety of attractive designs and templates are available in CANVA that can captivate user interest to support during the learning process. This application is easy to understand, simple, easily accessible to various ages and can increase student creativity. The utilization of CANVA in learning can have a positive impact on students' interest in learning. This shows that as a learning media, the use of this application is very suitable and feasible to use during the learning process. An interactive audio-visual-based learning media, the use of the CANVA application is a very appropriate choice to be applied when learning [26]. CANVA is able to support efforts to increase students' understanding of material [27]; [28]. CANVA is also able to help increase students' active participation and attract students' attention in the learning process [29].

Picture 2. Editing View

CANVA has benefits that can help during the learning process, among others, the design presented is attractive, able to increase the creativity of students and teachers, able to save time during the learning process, and its use can be accessed using a laptop or smartphone. With CANVA during learning, students are not bored because it has an attractive appearance in it [30].

2.2 Artificial Intelligent Google Classroom

Google Classroom is made possible by Google Apps for Education (GAFE). A web service called Google Classroom seeks to make it easier for teachers and students to share files, which in turn makes it easier to create, distribute, and grade assignments [31]; [32] .

2.3 Mathematical Literacy and Numeracy Literacy

Mathematical literacy according to [33], is the knowledge to understand and apply mathematics in everyday life in the past, present and future. The ability to read or write is a key competency that is very necessary in carrying out daily activities. If someone does not have the ability to read and write, it is difficult for that person's communication with other humans to develop to a higher level. Literacy is the ability to read, write, speak and use language and use all these abilities in more complex activities. In mathematics learning, activities are very important because they can help improve students' mathematics learning outcomes. This general idea of literacy is absorbed in other fields. One of the fields that absorbs it is mathematics, so the term mathematical literacy emerged. Society in general perceives mathematics as a language of symbols, numbers or numbers and associates it with numbers or numbers or number calculation operations such as addition, subtraction, multiplication, division, squaring, taking roots and so on. Draft Assessment Mathematics Framework PISA [34] defines mathematical literacy as a person's ability to formulate, apply and interpret mathematics in various contexts, including the ability to reason mathematically and use concepts, procedures and facts to describe, explain or estimate phenomenon of events/events. So mathematical literacy is a student's ability to apply knowledge gained from school and outside school to solve problems in the real world.

Numeracy Literacy is part of Mathematical Literacy. Numeracy Literacy is the ability to 1) solve practical problems in various everyday contexts using various kinds of numbers

and symbols related to basic mathematics; and 2) analyzing information presented in various forms to predict possible conclusions [35]; [5]. Numeracy literacy is an individual's ability which includes three indicators, namely 1) formulating, 2) using (employing), and 3) interpreting, applying and evaluating (interpreting, applying and evaluating) mathematics in various contexts [10].

2.4 Problem Based Learning (PBL)

PBL is a learning model that encourages students to carry out investigations to solve problems related to real life. Arends lists five steps in problem-based learning (PBL); orienting students to the problem, preparing the learning environment, individual and group investigations, creating and presenting work products, and assessing and evaluating problem solving procedures [36]; [37]. Students benefit from problem-based learning because it fosters independence in them and helps them think critically about relevant contextual issues [38]. According to Escribano & Del Valle, the benefits of PBL include: (1) encouraging students to participate more actively in their education; (2) helps them make meaningful connections between newly learned material and previous knowledge, resulting in more significant learning; (3) emphasize critical and creative thinking as key components of learning; and (4) emphasize interaction by improving interpersonal skills such as teamwork, peer evaluation, presentation, and job defense [39].

2.5 Indonesian Realistic Mathematics Education (PMRI)

The Indonesian Realistic Mathematics Approach (PMRI) is an approach that provides opportunities for students to be active in the learning process, where students are required to build their understanding of newly learned concepts [40]. PMRI provides students with the opportunity to think critically and creatively when analyzing mathematical concepts in real-world contexts. The aim of the PMRI approach in teaching mathematics is to help students develop their mathematical reasoning and understanding through problem solving and mathematical modeling [41].

PMRI is characterized by five key elements: (1) using the real world as a starting point for learning; (2) using models as a bridge between the real world and the abstract world; (3) using student results or strategies; (4) interaction as an important component in mathematics learning; and (5) the connection between each learning strand [42]; [43].

3 Method

3.1 Research design

The method used is a quasi-experimental design. Quasi-experimental research designs include a control group but do not fully control external factors that can influence the way the experiment is carried out [44]. The aim of this research experiment is to find out whether the use of the PBL model with the PMRI approach assisted by CANVA and Google Classroom can improve the mathematical literacy of class VIII middle school students. In this method, the researcher gave a pretest and posttest to the experimental class which was given PBL model -PMRI approach treatment using CANVA and Google Class (O1) and control class Discovery model with scientific approaches (O2).

Table 1. Quasi-experimental research design

Group	Pretest	Treatment	Postest
Experiment	O_1	X	O_2
Control	O_3		O_4

3.2 Sample and Data Collection

The population used in this research was all students in class VIII of SMP Negeri 20 Semarang for the 2023/2024 academic year, totaling 263 students divided into 8 classes. The sampling technique in this research is random sampling technique. The samples in this research were students in class VIII C as the experimental class who would apply the PBL model with the PMRI approach assisted by CANVA and Google Classroom and class VIII D as the control class with discovery learning using a scientific approach. Data collection using test data collection methods: this research uses pretest and posttest or

initial and final assessments. The purpose of this test is to evaluate students' initial and final mathematical literacy levels.

3.3 Analyzing Data

The data analysis technique in this research was carried out in several stages, 1) Prerequisite Test, prerequisite tests in this research include normality tests and homogeneity tests. The normality test in this study used the Kolmogorov-Smirnov test with a significance level, while the homogeneity test used the Levene test $\alpha=0.05$ with a significance level; 2) Test hypothesis I, namely the classical completeness test using the z test which is used to determine whether the mathematical literacy of students in the treatment class can achieve classical completeness; 3) Hypothesis II test $\alpha=0.05$, namely testing the difference between two sample means using the Independent Sample t-test; 4) Hypothesis test III, namely the increase test used to determine whether the average increase in the experimental class is greater than the average increase in the control class.

4 Results and Discussion

4.1 Results

There is an initial test, which is often called a pretest, before teaching in the experimental class begins. Next, the experimental class was given treatment using the PBL model with the PMRI approach assisted by CANVA and Google Classroom. Finally, a final assessment of students' mathematical literacy is carried out. After data collection, descriptive inferential statistics were applied to test the data.

Furthermore, a hypothesis test is carried out to answer the problem statement. The first hypothesis test is a proportion due diligence conducted to determine whether students' mathematical literacy in PBL learning with the PMRI approach assisted by CANVA and Google Classroom reaches the Actual Complete Limit in proportion. This test was performed using the help of SPSS 22 program and provided results as presented in Table 2 below.

Tabel 2. Test of Proportion Completeness Hypothesis

Statistics	Account
n	31
z_{count}	1,948
z_{table}	1,645

Based on Table 2 obtained $z_{count} = 1,948$ and $z_{table} = 1,645$ with a significant level of 5%. Because $z_{count} > z_{table}$, this means H_0 rejected and H_1 accepted. It can be concluded that the proportion of student completeness in PBL with the PMRI approach assisted by CANVA and Google Classroom reaches the Actual Complete Limit.

The second hypnosis test is a two-average difference test conducted to determine whether there is a difference in the average numeracy literacy of students who learn using the PBL with a PMRI approach assisted by CANVA and Google Classroom with students who learn using a discovery learning model with a scientific approach. Test the average difference using an independent sample test with the help of the SPSS 22 program. The test results of the difference in average mathematical literacy of the two classes are listed in Table 3.

Table 3. Test of Average Difference

		t-test Equality of Means		
		T	Df	Sig. (2-tailed)
Postest	Equal variances assumed	3,160	58	0,003
	Equal variances non assumed	3,137	53,783	0,003

Based on Tabel 3 it is known that the significance value is $sig = 0,003 < 0,05$ the decision taken is that H_1 is accepted. Which means that the average student who learns using the PBL with a PMRI approach assisted by CANVA and Google Classroom is more than students who learn using a discovery learning model with a scientific approach.

Furthermore, for the third hypothesis test, namely the average increase difference test used to determine whether there is a significant difference in average increase between the average increase in students in PBL learning with the PMRI approach assisted by CANVA and Google Classroom with the average increase in student discovery learning with a scientific approach in terms of student mathematical literacy. Test the average difference in improvement using an independent sample test with the help of the SPSS 22 program. The test results of the average difference in improvement between the two classes are listed in Table 4.

Table 4. Test of Average Difference in Improvement

T		t-test Equality of Means		
		T	**df**	**Sig. (2-tailed)**
Gain	Equal variances assumed	3,098	58	0,003
	Equal variances non assumed	3,127	55,617	0,003

Table 4 shows the significance value is $sig = 0,003 < 0,05$ the decision taken is that H_1 is accepted. Which means that the average increase in mathematical literacy of students who learns using the PBL with a PMRI approach assisted by CANVA and Google Classroom is more than the average with increase in mathematical literacy students who learn using a discovery learning model with a scientific approach.

To find out how much the increase in student mathematical literacy can be known through normalized gain criteria.

Table 5. Experimental Class Gain Test Results

Data	**Average**	**(g)**
Pretest	54,36	
Posttest	74,84	0,45

Based on Table 5, obtained normalized gain values is $(g) = 0,45$. Because the value *(g)* is in the interval $N - gain < 0,3$, **7**can be concluded that the average increase in student mathematical literacy in experimental classes on the PBL model with the PMRI approach assisted by CANVA and *Google Classroom* is moderate.

4.2 Discussion

Based on the results of research that has been done, it shows that proportion of student completeness in PBL learning with PMRI approach assisted by CANVA and Google Classroom reach the Actual Complete Limit. The PBL model provides opportunities for students to explore the knowledge they already have and connect with problems that are appropriate to the situation experienced by students. This is in line with research conducted by [45] that the provision of contextual problems can make students interested in solving problems, so that students become motivated and continue to focus on learning.

PBL learning with the PMRI approach assisted by CANVA and Google Classroom in experimental classrooms students have been seen active during learning. This is seen during group discussions and presentations with daily life problems. Thus, learning with the PBL model with a PMRI approach assisted by CANVA and Google Classroom which focuses on thinking activities through daily life problems has a positive impact on developing student mathematical literacy.

The results of the study stated that average students who learn to use the PBL model with an PMRI approach assisted by CANVA and Google Classroom more than students who learn to use discovery learning Approach scientific. The reason for the difference in learning outcomes is because the implementation of PBL with the PMRI approach is assisted by CANVA and Google Classroom helps students to understand the concept of problems that are used based on problems in everyday life. In the PBL model during the problem solving process, there will be an exchange of information between students with one another so that problems can be overcome. Thus, the concept of the material will be longer stored in the student's memory. By connecting everyday objects as learning contexts, the PMRI approach can assist students in understanding mathematical concepts from abstract to real. This allows students to independently discover the concept of learning material from the context that is used as a reference. The role of the media CANVA and Google Classroom very influential, students can learn and consult about material that has not been understood through CANVA and Google

Classroom which can be done anytime and anywhere, this is in accordance with research with research [46].

The results also stated the average increase in mathematical literacy of students who learn to use the PBL model with an PMRI approach assisted by CANVA and Google Classroom more than the average increase in mathematical literacy of students who learn to use discovery learning approach scientific. Increased average mathematical literacy in classes with PBL learning with PMRI approach by CANVA and Google Classroom included in the medium category, while in the class discovery learning approach scientific belongs to the low category. The benefits of PBL using the PMRI approach assisted by C ANVA and Google Classroom include: students will always be trained to solve contextual problems; students will always be invited to compare and discuss answers to problems; students will always learn how to draw conclusions; and students will be better able to understand contextual problems and describe the contextual problems they encounter founded on rational mathematical reasons [18]. Due to these benefits, students utilizing PBL with the PMRI approach assisted by CANVA and Google Classroom have higher numeracy literacy than students using the discovery learning   with a scientific approach.

5 CONCLUSION

The conclusions obtained based on the results and discussion are as follows. (1) Mathematical literacy test results of SMP Negeri 20 Semarang students with PBL learning with PMRI approach assisted by CANVA and Google Classroom reach the Actual Complete Limit in proportion. (2) Mathematical literacy of SMP Negeri 20 Semarang students with PBL learning with PMRI approach assisted by CANVA and Google Classroom is more than student mathematical literacy with discovery learning with scientific approach. (3) The average increase in mathematical literacy of students of SMP Negeri 20 Semarang with PBL learning with PMRI approach assisted by CANVA and Google Classroom is higher than the increase in student mathematical literacy with discovery learning with a scientific approach.

Based on the conclusions above, it can be concluded in general that the PBL model with the PMRI approach assisted by CANVA and Google Classroom is effectively used to improve student mathematical literacy.

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