Implementing Self-Paced Learning Method To Increase Critical Thinking Skills And Mathematics Concept Mastery Of Grade 1 Students In XYZ School

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Abstract. Education is an important factor in the formation of a new, superior generation. Education is dynamic because every generation is different and the situations they face also change. In classroom learning, teachers often find problems in the concept mastery, interest, and critical thinking skill of grade 1 students, especially in Mathematics. In this journal, the researcher discusses the implications of implementing self-paced learning using activity centers in grade 1. This journal was made using the literature research method and class experiment. Class experiments that are carried out include central activities that are presented in various activities that accommodate various student learning styles. The researcher found that implementing self-paced learning in Mathematics for grade 1 students through activity centers could increase students' motivation, interest, concept mastery and critical thinking skill in completing their Mathematics lesson in classroom. The final result of this study is that it can improve students' critical thinking skills and concepts mastery abilities by applying the self-paced learning method in the classroom for grade 1 students.

Keywords: Self-paced learning, concept mastery, critical thinking skill, learning style.

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INTRODUCTION

The COVID-19 pandemic that has hit the world since 2020 has changed the entire fabric of human life, including education. Students are forced to study online from their respective homes. Teachers are also forced to be able to use technology as a medium to deliver learning materials to students. Parents are required to be able to partially replace the teacher's role in accompanying their children so that they can still understand each subject well. Constraints often encountered when learning is carried out online are the limitations of the devices used by students, the ability of teachers to use applications to teach, the limited time they have to interact, and the constraints of unstable signals. This situation causes the learning process to be less than optimal, which impacts the gap in students' abilities in mathematics lessons in class.

In 2022, the gap in students' abilities is noticeable when the situation is considered to improve and schools are deemed ready to resume face-to-face learning. This problem happens because the assessment process sometimes needs to be more appropriate. After all, the learning outcomes collected by students are more than just the result of their work. In addition, many students need help understanding online learning materials but do not get maximum learning at home. Researchers see this problem as crucial and must take action to overcome the gap in the ability of grade 1 students, especially in Mathematics.

In Mathematics, students not only learn arithmetic but also understand concepts. In understanding concepts, students also have different grasping and learning styles. This condition makes teachers always have to innovate and find new ways to suit the needs of students in their class, especially with new problems that arise, namely the gap in the ability to understand concepts and students' critical thinking skills in solving math problems. One way is to apply self-paced learning. Currently, students are very close to technological developments. Coupled with online knowledge, students from PAUD to upper levels use technical means such as laptops or cell phones to learn at home and school. Therefore, this opportunity is perfect for introducing various alternative learning methods at school. Self-paced learning that uses

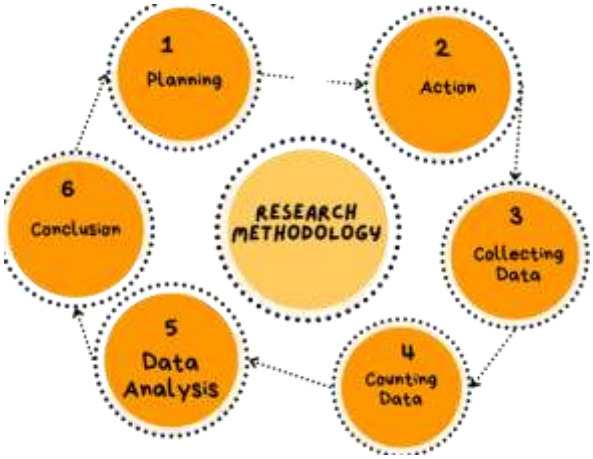
technology is expected to become a particular interest for students, especially in Mathematics.

Every teacher strives to help every student succeed and enjoy classroom learning. However, many teachers still need to reach this goal. Too much time is spent instructing the whole class. Even though students do not have the same abilities when studying, they have different speeds and learning styles. Using self-paced learning can motivate students to practice critical thinking skills to move forward in learning according to their abilities. Thus they can also master mathematical concepts in a way that suits their needs.

This study has a critical thinking rubric sheet and a written test to master concepts with additionand see subtraction from 0 to 20. This study aimed to see the relationship between critical thinking skills and concept mastery skills through self-paced learning methods. The benefit of this research is to add new insights for teachers in teaching mathematics in grade 1 and accommodate students' different learning needs.

METHOD

The research method is to design a measuring instrument to measure students' critical thinking skills and concept mastery. The study was pre-experimental because it only used one class of 23 students without a class control. The measuring instrument used in the study used a rubric of word problem solving and a written test. The research used three indicators to measure students' critical thinking skills. The rubric used a Likert scale with a rating of 1 = not meeting expectation, 2 = approaching expectation, 3 = meeting expectation, and 4 = exceeding expectation. For the written test, each question has different points: questions 1-3 have 2 points, questions 4-6 have 3 points, and question 7 has 5 points. The research took data from the rubric in addition to measuring the written test to measure students' ability to work on story questions.



Gambar 1. Research Model

Self-paced Learning application in the classroom

Self-paced learning is when students work at their own pace and move on to a new topic when mastery has been achieved on the previous topic or skip a specific topic if they can demonstrate knowledge through preliminary tests. Students learn at their speed and mood in building a constructive learning environment. Teachers realize that students are learning at different timesand are ready to learn at the same time. Therefore, students are motivated to set their own pace and tasks in learning. There are many methods and ways to attract students and help them to love learning. Through the use of exciting strategies, students will enjoy learning. Thinking of learning those lessons is fun, and feeling challenged to learn more. In the classroom application, we can create self-paced learning through activity centers. In this lesson, students will choose from several activities according to their needs and interests. The center's activities are expectedto accommodate the learning style, speed, and catchability of students who vary.

Mixed Instructions

At the beginning of the activity, students will be given learning materials in the form of videos which they can access through electronic devices available in the classroom, such as the Ipad, laptop, or maybe a class computer. Students access content through teacher-made videos or videos that correspond to material from the internet. Students are allowed to understand the material through videos so that they can set their strategies.

Independent Structure

The following activities within the center that students can do will help them build their critical thinking skills to learn better. In structure Independently, students will be presented with a variety of activities that support topics and goals learning. As mentioned at the beginning, actions can be designed differently and tailored to your needs in centers. This research creates an independent structure by giving the students three different activities. The first is the spelling of numbers center, the second is a hands-on activity connecting cubes to make tens and ones, and the last is the practice of addition and subtraction from 1-20.

Mastery-Based Assessment

Assessment is one of the crucial factors in classroom learning. Teachers use assessments to measure students' understanding of the topic they learn in class. However, students often don't enjoy the assessment process because it sounds complicated, and sometimes students feel like they need to improve when they need to be done better. Another thing that makes judgments is also often considered intimidating because it could be that students do not understand the material but already have to do the assessment task. Given these circumstances, it is essential to design Mastery-based assessments, such as those in self-paced learning. Students work on assessments and will progress from lesson to lesson next when they show mastery of concepts.

RESULT

There are two (2) hypotheses that measure through this survey, namely:

a. Hypothesis 1

H0: There is no relationship between mastery of mathematical concepts and critical thinking skills

H1: There is a relationship between mastery of mathematical concepts and critical thinking skills.

The first step in testing this hypothesis is to test the normality of the X and Y variable data using chi-square. In testing the X variable, the minimum value contained in the datais 9, and the maximum value is 20 with an interval of 1, while the average value is 14,625 with a standard deviation of 3,393. The calculation results show in Table 5.

Tabel 5. Variable X
Normality Test

Class	Lower limit	Upper limit	Freq	z1	z2	prob	Free xp	error
1	9	10	5	-1.81	-1.22	0.076	1.739	6.114
2	11	12	2	-1.22	-0.63	0.152	3.506	0.647
3	13	14	2	-0.63	-0.04	0.219	5.041	1.835
4	15	16	5	-0.04	0.54	0.225	5.173	0.006
5	17	18	7	0.54	1.13	0.165	3.787	2.727
6	19	20	2	1.13	1.72	0.086	1.978	0.000

From the table above, that X2hit is 11,329, while it knows that X2tab is 12,833. It can be concluded that the data for variable X distribution is normal (accept H0).

In testing the Y variable, the minimum value in the data is five, the maximum value is 12 with an interval of 1, and the average value is 9.3478 with a standard deviation of 1.7218. The calculation results show in Table 6.

Tabel 6. Variable Y Normality Test

Class	Lowe rlimit	Upper limit	Freq	z1	z2	prob	Freexp	error
1	5	6	2	-2.82	-1.654	0.047	1.07	0.802
2	7	8	3	-1.65	-0.492	0.262	6.03	1.522
3	9	10	11	-0.49	0.669	0.437	10.05	0.089
4	11	12	7	0.67	1.831	0.218	5.02	0.784
□			23			0.964	22.172	3.198

From the table above, that X2hit is 3,198, while it knows that X2tab is 9,348. It can be concluded The X and Y data variables are normally distributed based on the normality test of the X and Y data

Furthermore, the effect test can be calculated using a linear regression test. The magnitude of the intercept variable Y to X is 3.2847, and the slope of the variable Y to variable X is 0.4138, the equation of the line is obtained with the formula y=3.284684+0.413805x, which means that for every x increase by 1 unit, an increase in the value of y is 0.413805.

Table 7. Variable Y Normality Test

	Degree of Freedom	Sum Square	Mean Square	Fc	Ft
Regresion	1	3159.3596	3159.36	3035.37	4.32
Residual Error	21	21.8578	1.04		
Total	22	3181.2174			

The data variable Y is normally distributed (accept H0). From the table, it is obtained that Fc > Ft then rejects H0. In conclusion, there is arelationship between mastery of mathematical concepts and critical thinking skills.

a. Hypothesis 2

H0: The average value of student learning is equal to 70 H1: The average value of student learning is above 70

Tabel 7. The score for mastery of the concept of Mathematics

No	Name	XT	Score
1	Student A	15	75
2	Student B	15	75
3	Student C	10	50
4	Student D	9	45
5	Student D	18	90
6	Student E	15	75
7	Student F	18	90

No	Name	X T	Score
8	Student G	14	70
9	Student H	14	70
10	Student I	20	100
11	Student J	15	75
12	Student K	17	85
13	Student L	17	85
14	Student M	12	60
15	Student N	10	50
16	Student O	15	75

XYZ	XYZ value	Non-XYZ	Non-XYZ value
9	75	6	50
11	92	6	50
12	100	10	83
9	75	9	75
12	100	11	92
9	75	9	75
9	75	9	75
11	92	9	83
8	67	7	58
11	92	12	100
9	75		
9	75		
8	67		

Tabel 10. Two-population t test

	XYZ value	Non-XYZ value
Mean	81.4103	74.1667
Variance	140.6694	284.7223
Observations	13.0000	10.0000
Pooled Variance	202.4063	
Hypothesized Mean Difference	0.0000	
df	21.0000	
t Stat	1.2105	
P(T<=t) one-tail	0.1198	
t Critical one-tail	1.7207	
P(T<=t) two-tail	0.2396	
t Critical two-tail	2.0796	

The results can be seen in the table above from the collected and calculated data. The table above shows that the average critical thinking score of XYZ Kindergarten students is 81.4, which is higher than the average score of non-XYZ Kindergarten students, 74.1. This indicates that the self-paced learning method influences the critical thinking skills of XYZ

Kindergarten students in the class. So, it can be seen that the average value of critical thinking of XYZ Kindergarten students is higher (Accept H1)

CONCLUSION

1. The indicators used in the questions to measure the mastery of math concepts by grade 1 students are valid and reliable.
2. There is a correlation between concept mastery and the critical thinking skills of grade 1 students using the self-paced learning method, with a correlation value of 0.815, which indicates that the mastery of mathematical concepts and critical thinking variables correlate with each other.
3. The average score of students is 70 or above 70. This score means that self-paced learning improves students' mastery of mathematical concepts and critical thinking.
4. The average critical thinking score of XYZ Kindergarten students is higher than the critical thinking value of non-XYZ Kindergarten students
5. The data above shows that applying the self-paced learning method affects students' mastery of concepts and critical thinking skills.

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