Mathematical Critical Thinking Abilities of Student SMPN Sirenja through Realistic Mathematics Education (RME) and Contextual Teaching and Learning (CTL)

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Abstract- *The purpose of this study is to examine if there are differences in students' mathematical critical thinking ability based on their past mathematical knowledge and self-efficacy. This is a quasi-experimental study employing the Realistic Mathematics Education method (experimental class) and the Contextual Teaching and Learning method (control class). The subjects of the study were eighth- grade students from SMPN 1 Sirenja and SMPN 2 Sirenja during the 2020-2021 academic year. The results of the study indicate that: (1) there is no difference between the Realistic Mathematics Education approach and the Contextual Teaching and Learning approach in students' mathematical critical thinking skills; (2) there is no difference between the Realistic Mathematics Education approach and the Contextual Teaching and Learning approach in the mathematical critical thinkingability of students with high prior knowledge of mathematics; (3) There is no difference in the mathematical critical thinking ability of students with low prior knowledge of mathematics between the Realistic Mathematics Education and Contextual Teaching and Learning approaches; (4) There is no difference in the mathematical critical thinking ability of students with high self-efficacy between the Realistic Mathematics Education and Contextual Teaching and Learning approaches; (5) There is no difference in the mathematical critical thinking ability of students with low self- efficacy between Realistic Mathematics Education and Contextual Teaching and Learning; (6) There is no interaction between students' prior knowledge of mathematics and the learning approach to mathematical critical thinking skills; and (7) there is no interaction between students' self-efficacy and learning a mathematical critical thinking skill.*

Key words: critical thinking, RME, CTL

I. INTRODUCTION

Mathematical knowledge is developed by a process of interaction between students, educators, and learning resources in a structured learning environment. According to (Jaeng, 2013), mathematics is the study of arithmetic and everything associated with logic and abstraction. Counting and logical and abstract thought activities are inseparable from human daily life; therefore, mathematics has an important role to be acquired and taught to every student from a young age to college in order to aid the improvement of their thinking skills.

PISA (*Program for International Student Assessment*) uses students' mathematical abilities as a metric to measure the progress of education in a country, including Indonesia.

International Student Assessment and Trends in International Student Testing (The International Mathematics and Science Survey). The TIMSS results for 2007, 2011, and 2015 aredisplayed in Table 1.1.

Tabel 1.1. Hasil TIMSS pada Tahun 2007, 2011 dan 2015

Aspek pada domain proses kognitif	Tahun			Keterangan
	2007	**2011**	**2015**	
Pengetahuan	391	378	395	
Aplikasi	396	384	397	
Penalaran	394	388	397	
Skor rata-rata	**397**	**386**	**397**	Skor International 500
Ranking	36 dari 49 Negara Peserta	38 dari 42 Negara Peserta	45 dari 50 Negara Peserta	-

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According to Table 1.1, the observed student competencies include knowledge, application, and reasoning. 2007 TIMSS results place Indonesia 36th out of 49 participating countries, with an average score of 397, compared to the international average of 500. Moreover, according to the 2011 TIMSS findings, Indonesia is ranked 38th out of 42 participating nations with an average score of 386, while the international average score is 500. (Carin & Sund, 2012). 2015 TIMSS findings for the mathematics ability of fourth-grade elementary school children in Indonesia rated the country 45th out of 50 participating nations, with a mean score of 397, compared to the international mean score of 500. (Mullis et al., 2015).

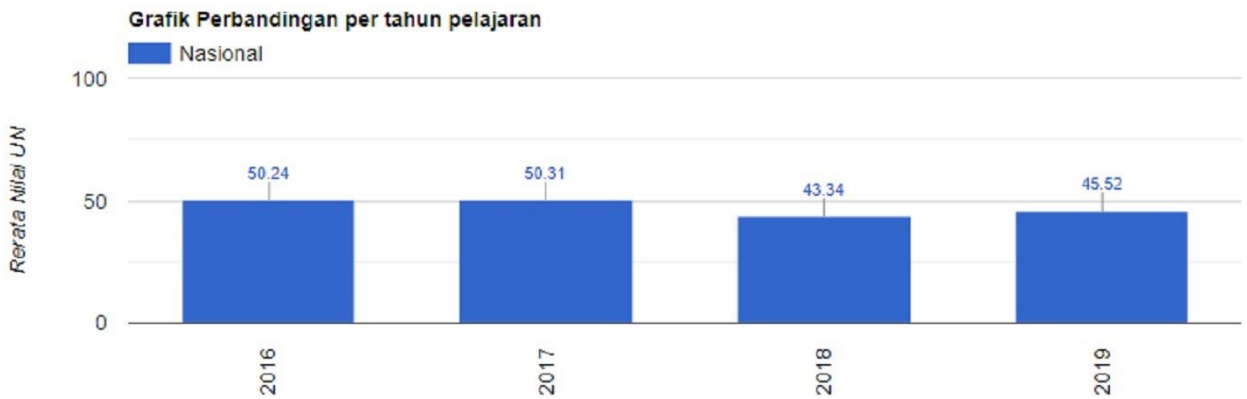
In addition to the results of TIMSS 2007, 2011, and 2015, the OECD announced the resultsof the 2018 Program for International Student Assessment (PISA) study, which revealed an average math score of 379 and an OECD average score of 486. Research conducted by PISA on student skills reveals a correlation between reasoning ability and higher-order thinking capacity.

Even when compared to Singapore, Thailand, and Malaysia, the results of the TIMSS and PISA studies indicate that the higher-order thinking skills of Indonesian pupils are well below the international average. Therefore, optimal development of higher-order thinking skills is required. According to Lewis and Smith (1993), higher order thinking skills consist of problem solving, critical thinking, creative thinking, and decision making. Some academics suggest that there are two indications of higher order thinking talents, namely critical and creative thinking (Mahmudi, 2009; Rosnawati, 2009; Tanujaya et al., 2017; Pratama & Retnawati, 2018)..

Low mathematical critical thinking and creative thinking skills, as seen by low mathematics learning outcomes, can be attributed to less meaningful and suboptimal learning. As stated by (Ismaimuza, 2013), low mathematics learning outcomes imply that something is amiss and that mathematics education in schools is not ideal.

In general, the mathematics ability of Indonesian junior-level secondary school students remain below average. As indicated in Graph 1.1, this is based on the outcomes of the national junior high school mathematics examination..

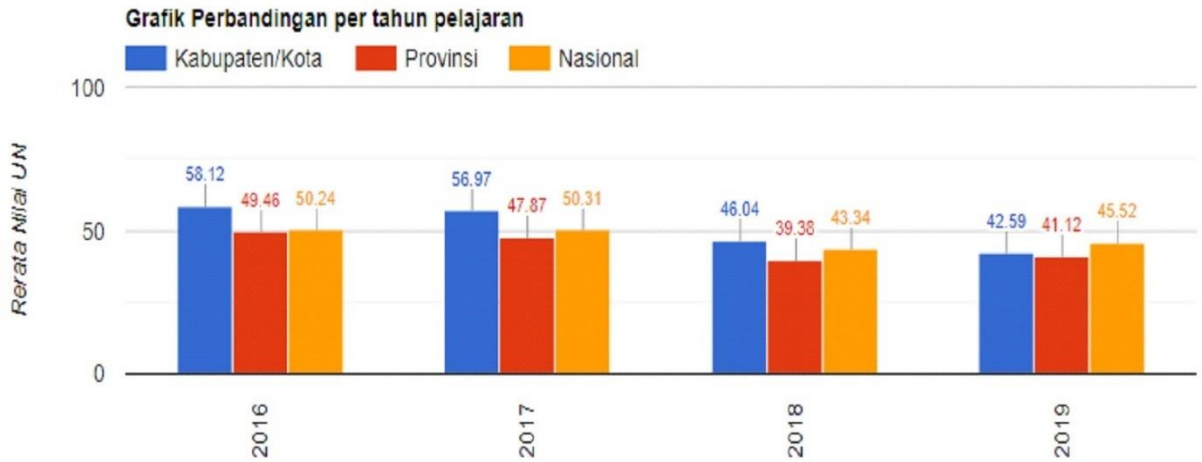
In 2016, the average score on the Mathematics National Examination was 50.24, as displayed in Graph 1.1. In 2017, it rose 0.07 points to 50.31. In 2018, it fell by 6.97 points to 43.34. And in 2019, it rose by 2.18 percent to 45.52. The average national math test score is 50, although the average value attained by Indonesian junior high school pupils in 2018 and 2019 is still below the national average..



Grafik 1.1.
Perbandingan Nilai Matematika per Tahun Pelajaran 2016, 2017, 2018, dan 2019.

In 2016, the average score on the Mathematics National Examination was 50.24, as displayed in Graph 1.1. In 2017, it rose 0.07 points to 50.31. In 2018, it fell by 6.97 points to 43.34. And in 2019, it rose by 2.18 percent to 45.52. The average national math test score is 50, although the average value attained by Indonesian junior high school pupils in 2018 and2019 is still below the national average.

The National Examination Results depicted in Graphs 1.1 and 1.2 indicate that the mathematical aptitude of junior high school students in Indonesia, and particularly in the



Grafik 1.2
Perbandingan Nilai UN Matematika per Tahun Pelajaran 2016, 2017, 2018, dan 2019

Donggala Regency, is below the national average.

According to (Hanafi, 2019), studying mathematics necessitates sophisticated problem-solving abilities. This demonstrates that critical thinking and mathematics are inseparable skills.

Mathematical learning is not always associated with simplicity in achieving maximal learning objectives. There are a number of elements that can influence student learning outcomes, including external and internal factors. The external aspect is the classroom learning process. Mathematics education in schools has not produced adequate outcomes to date (Chisara, 2018). The internal element is the initial mathematical aptitude of the students. According to (Hanafi, 2019), the initial ability of mathematics reflects the willingness of pupils to embrace mathematical learning supplied by the teacher. Students with low initial abilities have difficulty connecting the information being studied.

In addition to these two variables that comprise the cognitive aspect, there is also an emotive side that might influence the performance of children in learning mathematics. Self-efficacy is one of the affective components. Students must acquire the ability of self-efficacy; this is in agreement with the objectives of learning mathematics listed in the 2013 curriculum, namely having an attitude of appreciating the use of mathematics in everyday life, as well as inquisitiveness, focus, and interest in learning. Mathematics, perseverance, and problem-solving confidence. Self-efficacy refers to an individual's opinion of his or her capacity toplan and execute actions to acquire specific abilities (Bandura, 2006). In the research, (Maulida et al., 2018) found a correlation between self-efficacy and student mathematics learning outcomes. Self-efficacy is a student's belief in their ability, success, and persistence in learning and doing all mathematics activities, as well as their belief in the value of mathematics ineveryday life (Pajares & Graham, 1999).

There is a need for a solution that aims to improve the quality of classroom learning in

response to a variety of facts and issues pertaining to the process of learning mathematics in junior high schools, taking into account students' critical thinking skills, prior mathematical knowledge, and self-efficacy. According to the constructivist perspective, knowledge cannot be transmitted or taught by the teacher to the students; rather, the students must create or build their own knowledge.

According to (Kemendikbud, 2014), learning mathematics in the new 2013 curriculum is structured so that students must use critical thinking to solve issues. Learning does not begin with abstract content, but rather with concrete problems, then semi-concrete, and lastly problem abstraction. In addition, (Patahuddin, 2011) states in his work that mathematics must be connected to reality, must be near to children's experiences, and must be relevant to society in order for mathematics to have human value. Mathematical learning will be more meaningful if the instructional materials used to teach the subject contain information connected with real-world situations (Suastika & Rahmawati, 2019). Consequently, a learning technique that incorporates all of these elements is one that employs contextual problems. Realistic Mathematics Education (RME) learning approaches and Contextual Teaching and Learning (CTL) learning approaches utilize contextual challenges.

According to (Hidayat, 2018) the process in RME learning, learning begins with something tangible so that students can actively participate in meaningful learning. (Oktaviani, 2018) states that the use of RME in the teaching and learning process has a significant effect on critical thinking skills. In addition, several other research results also state that applying the RME approach in learning can improve junior high school students' mathematics learning outcomes (Anas et al., 2017; Sahanata & Jambi, 2018).

In addition to the RME approach, (Wahyuningtyas & Suastika, 2016) define contextual learning as a learning system that aligns the brain to develop meaning by integrating academic knowledge with the context of students' everyday life.

The researchers conducted a study in junior high schools in Sirenja sub-district, as Sirenja sub-district is one of several sub-districts in Donggala district, Central Sulawesi, based on the reality of the state of education in Indonesia in general and in Donggala district, Central Sulawesi in particular. On mathematical critical thinking abilities using Realistic Mathematics Education and Contextual Teaching and Learning techniques in terms of students' prior mathematical knowledge and self-efficacy, this has never been done in school before. This is a quasi-experimental study designed to give empirical evidence regarding differences between RME and CTL learning methodologies and mathematics critical thinking skills.

II. RESEARCH METHOD

This research is quasi-experimental since the researcher wishes to determine the efficacy of a treatment by comparing it to one or more comparison groups receiving other treatments. This study was done to examine the mathematical critical thinking abilities of students taught using the RME and CTL Pendekatan methods.

In this study, the population consisted of all eighth-grade SMP Negeri Sirenja subdistricts registered for the 2020-2021 academic year. The total number of class VIII SMPN students registered in the Sirenja subdistrict during the odd semester of 2020/21 was 401.

This study's sample was selected using a straightforward random sampling procedure. It is deemed random since the sample is conducted without consideration to the population's existing strata. The choice of a simple random sample technique was justified by the homogeneity of the population, as the class separation of study groups at the school was not based on academic aptitude assessments. SMPN 1 Sirenja and SMPN 2 Sirenja were chosen to represent the four SMPN schools in the Sirenja subdistrict. In each of these schools, two classes of study groups were selected at random; one class used a realistic mathematics education approach (experimental class) while the other class used a contextual teaching and learning approach (control class).

Table 2 displays the design employed for this study:

Table 2. Research Design

Critical Thinking Ability	**Learning Approaches (P)**	
	RME (P1) (Kelas Eksperimen)	CTL (P2) (Kelas Kontrol)

Students' initial knowledge of mathmatics (PAM)	High (T)	(PAM_T P_1)	(PAM_T P_2)
	Low (R)	(PAM_R P_1)	(PAM_R P_2)
***Self-efficacy* (SE)**	High (T)	(SE_T P_1)	(SE_T P_2)
	Low (R)	(SE_R P_1)	(SE_R P_2)

Keterangan :

P1	:	Learning Approach of RME
P2	:	Learning Approach of CTL
PAMT	:	Students' initial knowledge of mathematics
PAMR	:	Students' initial knowledge of mathematics (low)
SET	:	High *Self-efficacy*
SER	:	Low *Self-efficacy*
PAMT P1	:	The critical thinking abilities of kids with a high PAM who utilize With RME approach
PAMT P2	:	The critical thinking abilities of kids with a high PAM who utilize With CTL approach
PAMR P1	:	The critical thinking abilities of kids with a low PAM who utilize With RME approach
PAMR P2 : SET		The critical thinking abilities of kids with a low PAM who utilize With CTL approach
P1	:	The critical thinking abilities of kids with high *self-efficacy* who utilize With RME approach
SET P2	:	The critical thinking abilities of kids with high *self-efficacy* who utilize With CTL approach
SER P1	:	The critical thinking abilities of kids with low *self-efficacy* who utilize With RME approach
SER P2	:	The critical thinking abilities of kids with low *self-efficacy* who utilize With CTL approach

There are independent factors and dependent variables in this study. In this study, the independent variable is the learning strategy, specifically the RME and CTL approaches. In this study, the dependent variable is the mathematical critical thinking ability of eighth- grade SMPN students. Prior mathematical knowledge and self-efficacy of pupils are moderating variables or variables that alter (strengthen and weaken) the link between the independent and dependent variables. The modifier variable is also referred to as the second independent variable.

This study employed two types of instruments to collect data: test instruments and non-test instruments. The test instrument assessed students' mathematical critical thinking skills and prior knowledge of mathematics, whilst the non-test instrument (questionnaire) assessed students' mathematical self-efficacy. This study's data were analyzed using both descriptive and inferential statistics.

III. Results and DiscussionsVariance Analysis

1) First Hypothesis Testing

H_{01} : There is no difference between students who study with the Realistic Mathematics Education approach and those who study withthe Contextual Teaching andLearning approach with regard to their mathematical critical thinkingskills.

H_{11} : There are distinctions between Realistic Mathematics Education and Contextual Teaching and Learning pupils' critical thinkingabilities in mathematics.

The value of Sig.(2-tailed) was calculated to be 0.994 using the SPSS software for the t test. This demonstrates that Sig.(2-tailed) is more than 0.05, hence H01 is accepted and H11 is rejected.Thus, hypothesis one (H01) is accepted, which asserts that there is no difference between students who study with the Realistic Mathematics Education approach and those who study with the Contextual Teaching and Learning approach in terms of their mathematical critical thinking skills. The alternative hypothesis (H11) that there are disparities between Realistic Mathematics Education and Contextual Teaching and Learning students' mathematical critical thinking skills is rejected.

Based on the findings of the t-test, it can be concluded that there is no difference between students who study with the Realistic Mathematics Education approach and those who study with the Contextual Teaching and Learningapproach in terms of their

mathematical critical thinking skills. Therefore, there is no difference between the RME and CTL learning approaches in equipping students with mathematical critical thinking skills. Overall, based on the fact that the average score of students taught using the RME learning approach is not significantly different from the average score of students taught using the CTL learning approach, it can be concluded that both approaches can have an effect on improving students' mathematical critical thinking abilities. VIII SMP in Sirenja sub- district.

During the learning process, researchers focused on classes that used the RME approach and the CTL approach. In these classes, students became more enthusiastic about learning, paid more attention to it, and were more likely to ask questions. This is in contrast to the previous learning process, in which the teacher used the lecture method almost exclusively and this approach infrequently. The learning of contextual difficulties Therefore, there is no significant difference between the learning results of students taught using the RME technique and those taught using the CTL approach.

This is consistent with research conducted by Nasrullah, F. R., Asikin, M., Waluya, B., and Zaenur (2021), which states that learning Realistic Mathematics Education (RME) can improve mathematical critical thinking skills because it emphasizes the modeling process of mathematics with students' environmental conditions as the basis for learning. The conclusion of Silaen, M. Br(2021) .'s research that CTL learning is superior to traditional learning demonstrates that the CTL approach influences students' mathematical critical thinking skills. Shanti, W. N., Sholihah, D. A., and Abdullah, A. A. (2018) asserted in their study that the CTL strategy is very conducive to the development of critical thinking abilities during the learning process.

2) Second Hypothesis Testing

H_{02} : There is no difference between students who study with the Realistic Mathematics Educationapproach and those who study with the Contextual Teaching and Learning approach in terms of their mathematical critical thinking abilities.

H_{12} : There are differences between students who study using the Realistic Mathematics Educationapproach and those who study with the Contextual Teaching and Learning approach in terms of their mathematical critical thinking abilities.

The results of the calculation of the t test with the help of the SPSS application show that the value of Sig.(2-tailed) is 0.625. This shows that the value of Sig.(2-tailed) > 0.05, so H02 is accepted and H12 is rejected. Thus, the second hypothesis (H02) which states that there is no difference in the mathematical critical thinking ability of students who have a high prior knowledge of mathematics, between students who study with the Realistic Mathematics Education approach and learn with the Contextual Teaching and Learning approach, is accepted. The alternative hypothesis (H12) whichstates that there are differences in the mathematical critical thinking abilities ofstudents who have high prior knowledge of mathematics, between students who study with the Realistic Mathematics Education approach and learn with the Contextual Teaching and Learning approach, is rejected.

Based on the results of the t-test analysis, it can be concluded that there is no difference between the Realistic Mathematics Education approach and the Contextual Teaching and Learning approach in terms of the mathematical critical thinking abilities of students with a high prior knowledge of mathematics. In the experimental class that employs the mathematics realistic education learning approach, the averagevalue of students' mathematical critical thinking skills who have high prior knowledge of mathematics is greater than in the control class, which employs the Contextual Teaching and Learning approach. The results of the T test analysis indicate that there is no difference in the mathematical critical thinking abilities of students with high mathematical knowledge between those who study with the RME approach and those who study with the CTL approach. However, based on the average value obtained, it can be concluded that students with high prior mathematical knowledge performed better in the RME class than in the CTL class. According to research conducted by Fahrum (2018), the Realistic Mathematics Education approach can be utilized as an alternate learning method to foster mathematical critical thinking in pupils. For students with high critical thinking skills, they are able to understand the meaning of the problem and write down what is known and asked about the problem, able to write down the relationship concepts used in solving the problem, that is, they can make mathematical models of the problem into algebraic form, can solve problems with coherence and precision, andcan draw conclusions from the problem by using words or written text in full.

3) Third Hypothesis Testing:

$H_{0\$}$: There is no difference between students who study with the Realistic Mathematics Education approach and those who study with the Contextual Teaching and Learning approach in terms of their mathematical critical thinking abilities.

$H_{1\$}$: There are differences between students who study using the Realistic Mathematics Education approach and those who study with the Contextual Teaching and Learning approach in terms of their mathematical critical thinking abilities.

The value of Sig.(2-tailed) was calculated to be 0.797 using the SPSS software for the t test. This demonstrates that Sig.(2-tailed) is more than0.05, hence H03 is accepted and H13 is rejected. Thus, the third hypothesis (H03) is accepted,which asserts that there is no difference between students who study with the Realistic Mathematics Education approach and those who study with the Contextual Teaching and Learning approach in terms of their mathematical critical thinking capacity. The alternative hypothesis (H13) that there are differences between students who study using the Realistic Mathematics Education approach and those who study with the Contextual Teaching and Learning approach in their mathematical critical thinking abilities is rejected.

Based on the results of the t-test analysis, it was determined that there was no difference between the Realistic Mathematics Education approach and the Contextual Teaching and Learning approach in terms of the mathematical critical thinking skills of students with low prior knowledge of mathematics. In the control class that employs the Contextual Teaching and Learning method, the average value of students' mathematical critical thinking skills with low prior knowledge of mathematics is greater than the average value of students' mathematical critical thinking skills with low prior knowledge of mathematics in the class. An experiment employing a realistic mathematics education learning approach. The results of the T-test analysis indicate that there is no difference in the mathematical critical thinking ability of students with low prior knowledge of mathematics between students who study with the RME approach and students who study with the CTL approach. However, based on the average value obtained, it can be concluded that the mathematical critical thinking ability of students with low prior knowledge of mathematics is higher in the CTL class than in the RME class. This is corroborated by research conducted by Sundahry and Aldora (2021), which finds that the critical thinking skills of students with limited prior knowledge in class VA are superior to those of students in class VB in thematic learning in class V. This is because the effect of prior information has a significant impact on the development of new knowledge through the application of former experience. In addition, Fahrum (2018) found in his research that individuals with low critical thinking skills were unable to fulfill the markers of critical thinking skills, such as the ability to write down problem- solving, and were unable to draw rightconclusions from the problem.

4) Fourth Hypothesis Testing:

$H_{0\%}$: There is no difference in the mathematical critical thinking capacity of students with high self-efficacy who study using the Realistic Mathematics Education or Contextual Teaching and Learning approaches.

$H_{1\%}$: There are differences in the mathematical critical thinking skills of students with strong self-efficacy who study with the Realistic Mathematics Education approach versus those who study with the Contextual Teaching and Learning approach.

The value of Sig.(2-tailed) was calculated to be 0.694 using the SPSS program for the t test. This demonstrates that Sig.(2-tailed) is more than 0.05, hence H04 is accepted and H14 is rejected. Thus, the fourth hypothesis (H04) is accepted, which states that there is no difference in the mathematical critical thinking ability of students with high self-efficacy who study with the Realistic Mathematics Education approach and those who study with the Contextual Teaching and Learning approach. The alternative hypothesis (H14) that asserts there are differences in the mathematical critical thinking abilities of students with high self-efficacy between those who study using the Realistic Mathematics Education approach and those who study using the Contextual Teaching and Learning approach is rejected.

Based on the results of the t-test, it can be concluded that there is no difference in the mathematical critical thinking capacity of students with high self-efficacy who study with the Realistic Mathematics Education approach against those who study with the Contextual Teaching and Learning approach. N. Sugiati's research demonstrates that realistic mathematics learning has a positive effect on students' mathematical critical thinking skills and self- efficacy, and that there is an interaction between KAM and learning models on students' mathematical critical thinking skills, as well as aninteraction between learning models on students' self-efficacy. In addition, research conducted by Agustianti and Ruhiyati (2018) indicates that the implementation of learning to apply the CTLapproach in the classroom can be successful and have positive effects on students, as well as encourage students to construct their own understanding rather than relying on teacher explanations, so that the achievement and improvement of the mathematical critical thinking capacity of students who are given a learning method with a CTL approach can be measured.

In the experimental class that employs the mathematics realistic education learning strategy, the average value of students' mathematical critical thinking skills with strong self-efficacy islower than in the control class that employs the Contextual Teaching and Learning approach. Theresults of the T-test analysis indicate that there isno difference in the mathematical critical thinking skills of high self-efficacy students between those who study with the RME approach and those who study with the CTL approach. However, based on the average value obtained, it can be concluded that high student self-efficacy is higher in the CTL class than in the RME class.

5) Fifth Hypothesis Testing

$H_{0\&}$: There is no difference between Realistic Mathematics Education and Contextual Teaching and Learning in the mathematics critical thinking capacity of low self- efficacy pupils.

$H_{1\&}$: There are differences in the mathematical critical thinking skills of students with low self-efficacy who study using the Realistic Mathematics Education approach against those who study using the Contextual Teaching and Learning approach.

The value of Sig.(2-tailed) was calculated to be 0.926 using the SPSS software for the t test. This demonstrates that Sig.(2-tailed) is more than 0.05, hence H05 is accepted and H15 is rejected. Thus, the fifth hypothesis (H05) is accepted, which states that there is no difference in the mathematical critical thinking ability of studentswith low self-efficacy who study with the Realistic Mathematics Education approach versus those who study with the Contextual Teaching and Learning approach. The alternative hypothesis (H15) that asserts there are differencesin the mathematical critical thinking abilities of low self-efficacy students between those who study with the Realistic Mathematics Education approach and those who study with the Contextual Teaching and Learning approach is rejected.

Based on the results of the t-test, it can be concluded that there is no difference in the mathematical critical thinking ability of low self-efficacy students between those who study with the Realistic Mathematics Education approach and those who study with the Contextual Teaching and Learning approach. The mathematical critical thinking ability of studentswith low self-efficacy in the experimental class using the realistic mathematics education learning approach received an average score of 59.92, which was not significantly different fromthe average score of 59.69 obtained by students in the control class using the contextual teaching and learning approach. With a difference in average score of 0.23 indicating that the average value in the RME class is bigger than the average value in the CTL class, it can be concluded that the mathematical critical thinking ability of students with low self-efficacy is higher in the RME class than in the CTL class.

6) Sixth Hypothesis Testing

H_{06} : There is no connection between the prior mathematical knowledge of pupils and the approach to learning mathematical critical thinkingabilities.

H_{16} : There is a relationship between the prior mathematical knowledge of pupils and the approach to learning mathematical critical thinkingskills.

The value of Sig.(2-tailed) was calculated to be 0.612.2 using the SPSS software for the two-way ANOVA test. This demonstrates that Sig.(2-tailed) is more than 0.05, hence H06 is accepted and H16 is rejected. Thus, hypothesis six (H06) is accepted, which argues that there is no relationship between prior mathematical knowledge and learning approaches to mathematical critical thinking skills. The sixth (H16) hypothesis, which claims that there is a connection between prior mathematical knowledge and learning techniques for mathematical critical thinking, is rejected.

According to the findings of the two-way ANOVA, there was no interaction between students' prior mathematical knowledge and the learning strategy to mathematical critical thinking skills. Students with high prior knowledge are taught using a learning approach that incorporates contextual problems, such as the Realistic Mathematics Education approach and the Contextual Teaching and Learning learning approach, resulting in students with high mathematical critical thinking skills. Students with low prior knowledge are taught using a learning approach. using contextual problems, such as the Realistic Mathematics Education approach and the Contextual Teaching and Learning learning strategy, leads to low mathematical critical thinking skills among pupils. Consequently, the quality of students' mathematical critical thinking skills is determined by the students' baseline mathematical aptitude and not by variances in learning methodologies. In other words, prior mathematical knowledge and learning strategies have little bearing on pupils' mathematical criticalthinking skills..

This is validated by research conducted by Sundahry and Aldora (2021), which revealed thatthere was no significant difference between the critical thinking skills of students with high prior knowledge in class VA and those of students in class VB during thematic learning in class. V. Students with a strong foundational understanding are able to connect the stages of a subject. Moreover, it is supported by research conducted by Syafitri (2018) on students at the Pekanbaru 13 public junior high school, which demonstrated that there was no interaction between students' prior mathematical knowledge and the Realistic Mathematics Education (RME)approach to students'

mathematical critical thinking skills. Another study conducted by Husna (2021) on students' initial mathematical abilities, Contextual Teaching and Learning (CTL) models, and students' mathematical critical thinking skills revealed that there was no initial interaction between early mathematical abilities and the model with regard to students' mathematical critical thinking skills.

7) Seventh Hypothesis Testing

$H_{0(}$: There is no relationship between the self-efficacy of students and their approaches to acquire mathematical critical thinking skills.

$H_{1(}$: There is a relationship between the self-efficacy of students and their approach to learning mathematical critical thinking skills.

The value of Sig.(2-tailed) was calculated to be 0.73 when the two-way ANOVA test was performed using the SPSS program. This demonstrates that Sig.(2-tailed) is more than 0.05, hence H07 is accepted and H17 is rejected. Thus, the seventh hypothesis (H07) is accepted, which indicates that there is no connection between students' self-efficacy and learning techniques to mathematical critical thinking skills. Students' self-efficacy and learning techniques to mathematical critical thinking skills do not interact, refuting the alternative hypothesis(H17).

Self-efficacy or students' self-confidence in dealing with learning, particularly learning mathematics, is crucial. Students' self-confidence in their ability to solve arithmetic problems will motivate them to perform well. Based on theresults of the two-way ANOVA, it was determined that there was no interaction between the self-efficacy of students and the learning strategy for mathematical critical thinking skills. Students who are taught using a realistic mathematics education approach and students who are taught using a contextual teaching and learning approach achieve the same level of critical thinking skills during the learning process, indicating that the learning approach andstudents' self-efficacy have no significant effect. On mathematical critical thinking skills, studentswith high self-efficacy are taught using a contextual teaching and learning strategy and taught using a realistic mathematics education approach, whereas students with low self-efficacy are taught using a realistic mathematics education approach. Students who are educated using a contextual approach to teaching and learning have poor critical thinking skills. Thus, there is no connection between learning technique and self-efficacy in relation to students' mathematical critical thinking abilities.

This is reinforced by research conducted by Hidayat and Noer (2021), which indicates that students with high self-efficacy will be able to thoroughly solve questions, whereas students with low self-efficacy are typically less adept at solving difficulties. Students with low self- efficacy have poor critical thinking skills in mathematics, whereas students with high self- efficacy have excellent critical thinking skills in the online learning process. Educators or teachers must raise students' self-efficacy in mathematics learning activities before they can improve students' critical mathematical reasoning.

IV. CONCLUSIONS

As the results of the research and discussion, the following conclusions can be drawn: (1) There is no difference in students' mathematical critical thinking abilities between Realistic Mathematics Education and ContextualTeaching and Learning. (2) There is no difference in the mathematical critical thinking ability of students with high prior knowledge of mathematics between Realistic Mathematics Education and Contextual Teaching and Learning.; (3) there is no difference between the Realistic Mathematics Education approach and the Contextual Teaching and Learning approach in the mathematical critical thinking ability of students with low prior knowledge of mathematics; (4) there is no difference between the Realistic Mathematics Education approach and the Contextual Teaching and Learning approach in the mathematical critical thinking ability of students with high self-efficacy; (5) There is no difference in the mathematical critical thinking ability of students with low self-efficacy between Realistic Mathematics Education and Contextual Teaching and Learning; (6) There is no interaction between students' prior knowledge of mathematics and the learning approach to mathematical critical thinking skills; and (7) there is no interaction between students' self-efficacy and learning a mathematical critical thinking skill.

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