The Influence of Contextual Teaching Learning Models Reviewed from Self-Efficacy on Critical Thinking Ability

Tri Dedy Wahyu[1,*], Kamid[2], Muhammad Rusdi[3]
[1,2,3]Universitas Jambi, Jambi
*Corresponding Author: tdediwahyu25@gmail.com

ABSTRACT

This study applies a contextual teaching learning model (CTL) which can be a solution for teachers in optimizing the critical thinking skills of students. This research is a queue to make the effect of the CTL application model on the ability to think of students' critical mathematics, the effect of efficacy models of critical thinking critical model critical models of critical models, and objectives, critical mathematics. This research is an experimental study that uses posttest only control design. The population of this study was all students of class X MA Negeri 2 Batanghari Academic Year 2022/2023 as many as 92 students and were divided into 3 classes. In this study, the sample used was 62 students who were divided into two classes (experimental class I and control classes). The sample is determined by a simple random sampling technique. The instruments in this study are a questionnaire for self-efficacy and testing of critical mathematical thinking skills. The data obtained were analyzed using the two-path anova test. The results of this study are the CTL model more effectively affects the ability to think critically mathematics than the category of category category high category more highly interested students with low categories.

Keywords: critical thinking; contextual teaching learning; self-efficacy

INTRODUCTION

Mathematics is the most basic provision for students to improve their logical, critical, practical, systematic, analytical and creative thinking skills. Mathematics has a relationship with critical thinking skills (Inayah et al., 2021; Situngkir et al., 2023). Mathematical material and critical thinking skills are two things that cannot be separated, because mathematical material is understood through critical thinking, and critical thinking is trained through studying mathematics (Nuraida et al., 2023; Oktaviani et al., 2021; Rahmi et al., 2023; Rammadan & Budiman, 2022).

Critical thinking ability is one of the cognitive components of students that supports their success in the learning process. Critical thinking ability is a thinking ability that includes a set of skills and abilities to produce and process information (Tari & Rosana, 2019). Mathematical critical thinking is a thinking process with the aim of making reasonable decisions about what is believed to be the truth and can be done correctly. Critical thinking skills in mathematics are one of students' higher-level thinking skills. Critical thinking in mathematics tends to be possessed by people who are able to think critically because that person will try to reason and look for strategies for solving mathematical problems (Dewi Ambar Wati, Lilik Ariyanto, 2018)

The reality is that currently the mathematics learning process carried out in most schools still experiences difficulties in achieving competence in mathematical critical

thinking skills. Mathematics learning only focuses more on routine practice and low level questions and only focuses on explanations given by teachers and resource books owned by students (Lestari, 2020).

There are several ways that can be done to improve students' critical thinking skills. One way that can improve students' critical thinking skills in mathematics is by using appropriate learning models. One learning model that can improve critical thinking skills in mathematics is the CTL model. The contextual teaching and learning (CTL) model is a learning approach where students learn to connect learning material with real situations so that the knowledge they gain can be meaningful (Hobri, 2018). This knowledge is built through real experience about how to solve problems, discover things and develop ideas. The ability to solve problems, discover and develop ideas is included in critical thinking skills in mathematics (Kurniati et al., 2015; Kurniawati, 2018; Zuliyanti & Pujiastuti, 2020).

In the mathematics learning process, student activities will emerge in the use of Contextual Teaching and Learning and Problem Based Learning models where teachers bring the real world into the classroom and encourage students to make connections between the knowledge they have and its application in their daily lives as something that must be done. students learn to train and improve critical thinking and problem solving skills as well as gain knowledge of important concepts (Salsabila et al., 2023; Septian et al., 2021; Trisnawati et al., 2019).

Apart from the learning model applied, another thing that is considered important is students' attitudes in studying mathematics, one of which is self-efficacy. Self-efficacy is a psychological aspect that has a significant influence on students' success in completing assignments and problem-solving questions well (Liu & Koirala, 2009). Self-efficacy is a person's belief in their ability to overcome various problems that arise in life that influence a person's cognition and actions (Ghufron and Risnawati, 2018).

Individuals who have low self-efficacy will avoid all tasks and give up easily when problems arise (Bandura, 1993). Students who have high self-efficacy also have a high level of critical thinking skills in mathematics, and vice versa (Sukma & Priatna, 2021). Therefore, the expected results of this research are: it can improve students' critical thinking skills in mathematics by applying the CTL model, and it is hoped that it can generate good self-efficacy in students so that they have good critical thinking skills in mathematics too.

Based on the description above, this research is a queue to make the effect of the CTL application model on the ability to think of students' critical mathematics, the effect of efficacy models of critical thinking critical model critical models of critical models, and objectives, critical mathematics.

RESEARCH METHODS

This research is experimental research. The stages of this research began with creating and filling out a student self-efficacy questionnaire, then during the learning process they were given treatment using the CTL model, after 4 meetings they were given posttest questions regarding critical thinking skills in mathematics.

The population of this study was the entire class X MA Negeri 2 Batanghari consisting of 92 students in 3 classes. Sampling in this research was carried out using random sampling technique. The sample consisted of 62 students, of which there were 2 classes, namely the experimental class (using the CTL model) and the control class using conventional learning).

The experimental class (X-1) consists of 32 students and the control class (X-II) consists of 30 students. This research consists of three variables, namely the independent variable, the dependent variable and the moderator variable. The independent variable consists of the CTL learning model), the dependent variable consists of critical thinking skills in mathematics and the moderator variable consists of self-efficacy. This research used a posttest only control design. Furthermore, the research design can be seen in Table 1.

Table 1. Research Design

Class	Treatment	Post-test
Experiment (CTL)	x_1	o_2
Control	x_2	o_2

Information:
X_1: CTL
X_2 conventional learning

The types of instruments used in this research are tests and questionnaires. The questionnaire used is a self-efficacy indicator which consists of 20 questions. This questionnaire uses a Likert scale. The instrument is a test, namely a test of students' critical thinking skills in mathematics which consists of 2 questions. The material provided is series and series material with predetermined indicators.

This research data analysis technique was carried out using several tests consisting of:

1. Content Validity Test
   Test the content validity of the question instruments and questionnaires which are tested by experts, namely Unja postgraduate lecturers.
2. Construct Validity Test
   To calculate the validity of the questions, use the product moment formula. The results of the 2 test items on students' mathematical critical thinking solving abilities that were tested were all valid.
3. Reliability Test
   This reliability test uses the alpha formula. The result is a test of students' critical thinking mathematical solving ability of 0.79 with high reliability.
4. Differential Power Test and Test Difficulty Level
   The result is that the two questions have quite different levels of difficulty in the easy and medium categories.

Next, the hypothesis prerequisite tests are carried out, namely the normality test and homogeneity test. After the normality and homogeneity prerequisite tests are fulfilled, the hypothesis test can be carried out using two-way Anova.

RESULTS AND DISCUSSION

The data collected in this research consisted of self-efficacy data and data on students' critical mathematical thinking abilities on sequence and series material. Data was obtained from experimental class I using the CTL model and the control class using conventional learning. This self-efficacy data was obtained through a questionnaire regarding indicators of self-efficacy. The results of self-efficacy can be seen in Figure 1.
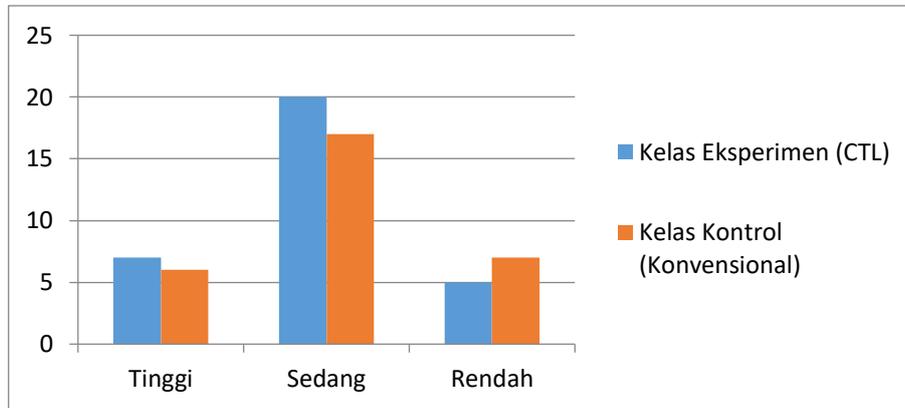

Figure 1. Self-Efficacy Results

Based on Figure 1, it can be seen that the self-efficacy data in the experimental class that applies the CTL model has more students who have higher self-efficacy compared to the control class that applies conventional learning, as well as at a medium level of self-efficacy, while at a low level the control class classified as more.

Data on mathematical critical thinking abilities was obtained through tests. This test is carried out to measure students' critical mathematical thinking. The results can be seen in Table 2. Before carrying out the two-way ANOVA test, first carry out a normality test and a homogeneity test. The normality test can be seen in Table 3.

Table 2. Data on Mathematical Critical Thinking Ability

Learning model	Data	Mean	Min	Max
Experiment (CTL)	32	12,19	5	21
Control (Conventional)	30	10.03	3	18

Table 3. Normality Test

Learning model	Calculate Statistics	df	Sig.	Decision
Contextual Teaching and Learning(CTL)	0.119	32	0.200	Normal
Conventional	0.141	30	0.132	Normal

Based on the results of the normality test from the Kolmogorov-Smirnov Test, it can be seen from Table 3 that the significance value obtained from the experimental and control classes is greater than 0.05, namely 0.200 for the CTL model, and the conventional model is 0.132. Thus, it can be concluded that the critical thinking ability test data for mathematics based on the learning model comes from a normally distributed population.

Based on homogeneity test calculations, the homogeneity test results for the experimental class and control class were 0.079, greater than 0.05. So, it can be concluded that the samples in research based on the learning model have the same variance. After the prerequisite tests and homogeneity of the questions are fulfilled, the two-way ANOVA test can then be carried out. The results of the anova test can be seen in Table 4.

Table 4. Two-Way Anova Test

Learning model	df	Mean	Sig.
Contextual Teaching and Learning(CTL)	2	13.41	0.001
Self Efficacy	2	257,180	0,000
Learning Model* Self Efficacy	4	7,635	0,000

Based on Table 4. The results of the two-way Anova test on the first hypothesis show that the significance value is $0.0001 < 0.05$. Meanwhile H_1 means there is an influence of applying the CTL model on students' critical thinking abilities, while H_0 says there is no influence of applying the CTL model on students' critical thinking abilities. Thus H_1 is accepted and H_0 is rejected. So, it can be concluded that there is an influence of the CTL model, conventional learning on students' critical thinking abilities. The CTL model obtained a mean score of 13.41 higher than conventional learning, so it can be concluded that the CTL model is more effective than conventional learning in influencing students' mathematical critical thinking abilities.

The application of the CTL model is able to improve students' critical thinking skills in mathematics compared to conventional learning. The Contextual Teaching Learning (CTL) model is a learning concept that helps teachers relate the material taught to students' real-world situations which encourages students to build relationships between the knowledge they have and its application in everyday life.(Simbolon et al., 2022). So, by applying the CTL model students will get used to solving problems so that the CTL model is able to improve students' critical thinking skills.

Improving critical thinking skills in mathematics for students who receive the CTL model is better than students who receive the direct learning model (Panjaitan & Hasibuan, 2018). This shows that the average critical thinking ability of students taught using the CTL model has a higher average critical thinking ability than students taught using the direct learning model. Students are more active in learning and make students accustomed to learning using real world problems which can improve their critical thinking skills in mathematics. The CTL model is a holistic learning model which has the aim of helping students understand the meaning of teaching material, especially in the field of mathematics studies by linking teaching material with context in everyday life (Rahmi2016).

An effective learning model will help students improve their mathematical problem-solving abilities. Learning that applies Contextual Teaching and Learning (CTL) has a significant influence in improving students' critical thinking skills in mathematics. However, there are still some students who find difficulties when they find problems and solutions which make students give up a little. Therefore, teachers must pay attention to all students, especially students who have problems so that problems can be resolved.

In the control class with conventional learning, students are not very active, because all that is needed is the ability to listen. Meanwhile, students' listening abilities also vary. In this research, it was found that students' listening skills were lacking. Apart from that, the weakness is that there is no cooperation or ability to collaborate because learning is not designed for joint problem solving. The findings of this researcher are not much different from what has been stated, namely: 1) Not all students have the best way of learning by listening, 2) It is often difficult to keep students interested in what they are learning, 3) Students do not know what the purpose is. they learn that day, and 4) The emphasis of learning is often solely on completing assignments(Karim, 2017).

The results of the two-way Anova test on the second hypothesis show that the significance value is $0.000 < 0.05$. As for H_1 stated that there is an influence of students' self-efficacy on students' mathematical critical thinking abilities, meanwhile H_0 reads that there is no influence of self-efficacy on students' mathematical critical thinking abilities. Therefore H_1 accepted and H_0 rejected. So, it can be concluded that there is an influence of high self-efficacy, moderate self-efficacy, and low self-efficacy on students' mathematical critical thinking abilities. Because it was rejected, it was continued with a further test. In this study, the further test used was the Tukey test. The results of the Tukey test calculation can be seen in Table 5.

Table 5. Tukey test

Self Efficacy	N	Subset I
Low	11	6.91
Currently	37	10.78
Tall	44	14.27
Sig		1,000

Based on the data in Table 5, it can be concluded that high and medium self-efficacy are more effective than students with low self-efficacy. Based on the results of calculations in this research, it was found that critical thinking skills in mathematics who have high and moderate self-efficacy are better than students who have low self-efficacy. This is because self-confidence influences students' critical mathematical thinking abilities.

Besides that, the impacts if students have good self-efficacy skills are numerous, including: 1) students' self-efficacy in asking what they don't know, 2) students' self-efficacy in being confident in working on questions, 3) students' self-efficacy in expressing opinions in in groups, 4) students' self-efficacy in solving a problem independently or not cheating, etc.

*Self-efficacy*as one of the main factors in studying mathematics. Students' self-efficacy attitudes are one aspect that a teacher needs to consider in learning. Students' self-efficacy is an attitude of confidence and self-confidence that students have in overcoming feelings of anxiety and doubt. So that students who have good self-efficacy skills can take action and solve problems to obtain optimal results, can influence situations well, and can overcome obstacles that will be encountered when solving problems.

Based on Bandura's theory, self-efficacy refers to students' beliefs about their ability to complete certain tasks. Individuals who have low self-efficacy will avoid all tasks and give up easily when problems arise. Students who have high self-efficacy also have a high level of critical thinking skills in mathematics, and vice versa (Sukma & Priatna,

2021). Self-efficacy influences individuals' choice of actions, the amount of effort they expend, and how long they persist in the face of difficulties. The higher the self-efficacy, the greater the effort that will be exerted (Lianto, 2019).

The results of the two-way Anova test on the third hypothesis show that the significance value is $0.000 < 0.05$. As for H_1 reads that there is an interaction between the CTL model and students' self-efficacy towards critical thinking skills in mathematics, meanwhile H_0 reads that there is no interaction between the CTL model and students' self-efficacy towards critical thinking skills in mathematics. Therefore, H_0 rejected and H_1 accepted. So, it can be concluded that there is an interaction between the CTL model and students' self-efficacy towards critical thinking skills in mathematics. The graph can be seen in Figure 2.
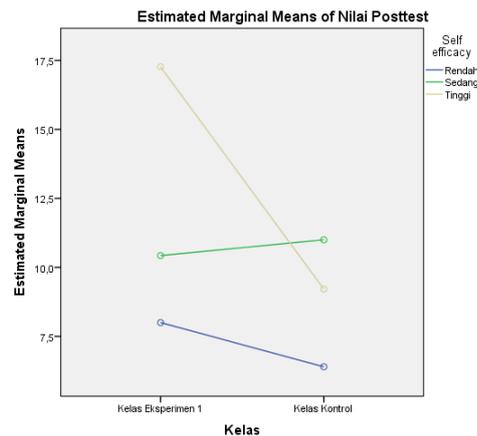

Figure 2. Interaction of the model with self-efficacy on critical thinking skills in mathematics

Based on Figure 2, it can be seen that there are lines touching each other and parallel, which means there is an interaction between the learning model and student self-efficacy. So, it can be said that this interaction means that there is an effect of the CTL model on students' critical thinking skills in mathematics which is also influenced by students' self-efficacy.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that there is an influence of the CTL model on students' mathematical critical thinking abilities, and there is an influence of self-efficacy on each student's mathematical critical thinking abilities. The CTL model is more effective in influencing critical thinking skills in mathematics compared to conventional learning, and self-efficacy influences critical thinking skills in mathematics compared to self-efficacy in the low category. And there is an interaction between the learning model and self-efficacy on students' critical mathematical thinking abilities.

REFERENCES

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, *28*, 117–148.

Dewi Ambar Wati, Lilik Ariyanto, S. (2018). Efektivitas Antara Model Pembelajaran

Discovery Learning Dengan Model Pembelajaran Pair Check Terhadap Kemampuan Berpikir Kritis Matematis Siswa Kelas VII. *Media Penelitian Pendidikan: Jurnal Penelitian Dalam Bidang Pendidikan Dan Pengajaran*, *12*(1), 12–25.

Ghufron dan Risnawati. (2018). *Teori-Teori Psikologi* (ed. II). Ar- Ruzz Media.

Hobri. (2018). High-order thinking skill in contextual teaching and learning of mathematics based on lesson study for learning community. *International Journal of Engineering and Technology(UAE)*, *7*(3), 1576–1580. https://doi.org/10.14419/ijet.v7i3.12110

Inayah, S., Septian, A., & Komala, E. (2021). Efektivitas Model Flipped Classroom Berbasis Problem Based Learning dalam Meningkatkan Kemampuan Berpikir Kritis. *Wacana Akademika: Majalah Ilmiah Kependidikan*, *5*(2), 138–144.

Karim. (2017). *Pembelajaran Abad 21*. Gava Media.

Kurniawati, N. (2018). Mengakses dan Memonitor Kemampuan Berpikir Kreatif Matematis Siswa Kelas V Sekolah Dasar dalam Pembelajaran Matematika. *PRISMA*, *7*(1), 99. https://doi.org/10.35194/jp.v7i1.362

Lestari, F. P. (2020). The Implementation of Mathematics Comic through Contextual Teaching and Learning to Improve Critical Thinking Ability and Character. *European Journal of Educational Research*, *10*(1), 497–508. https://doi.org/doi: 10.12973/eu-jer.10.1.497

Lianto. (2019). Self-Efficacy : A brief literature review. *Jurnal Manajemen Motivasi*, *15*, 55–61.

Liu & Koirala. (2009). The Effect of Mathematics Self-Efficacy on Mathematics Achievement of High School Students. *NERA Conference Proceedings*, 10–22.

Nuraida, E. M., Santri, D. D., Warti, R., Rahmawarni, D., Leoni, L., & Aprianto, R. (2023). Pengembangan Soal Pemodelan Matematika dengan Konteks Paket Belajar untuk Menganalisis Kemampuan Berpikir Kritis Siswa Madrasah Tsanawiyah. *PRISMA*, *12*(2), 642–649. https://doi.org/10.35194/jp.v12i2.3823

Oktaviani, I. A., Ariyanto, L., & Utami, R. E. (2020). Analisis Kemampuan Berpikir Kritis Siswa dalam Menyelesaikan Masalah Matematika Ditinjau dari Gaya Kognitif Reflektif dan Kognitif Impulsif. *Imajiner: Jurnal Matematika dan Pendidikan Matematika*, *2*(6), 485-491.

Panjaitan, A. M. dan, & Hasibuan, E. A. (2018). Penerapan Model Pembelajaran Contextual Teaching And Learning (CTL) Terhadap Kemampuan Berpikir Kritis Matematika Siswa Kelas VIII di SMP Negeri 10 Padangsidimpuan. *Jurnal Penelitian Dan Pembelajaran MIPA*, *3*(2).

Rahmi, D. F., Satrio, M. T. J., Azmy, D. S., & Septian, A. (2023). Penerapan Model ICARE Berbasis Media Powtoon untuk Meningkatkan Kemampuan Berpikir Kritis Matematis Siswa. *PRISMA*, *12*(2), 486–493. https://doi.org/10.35194/jp.v12i2.3758

Rammadan, A. P., & Budiman, I. (2022). Kemampuan Berpikir Kritis Siswa Kelas XI SMK Negeri 1 Rawamerta Pada Materi Peluang. *Prisma*, *11*(1), 154. https://doi.org/10.35194/jp.v11i1.2049

Salsabila, G., Septian, A., Inayah, S., Hanifah, N., & Komala, E. (2023). Penerapan Model Pembelajaran Visualization , Auditory , Kinesthetic (VAK) terhadap Kemampuan Pemahaman Konsep Matematika Siswa. *Intellectual Mathematics Education (IME)*, *1*(1), 33–39.

Septian, A., Ramadhanty, C. L., Darhim, D., & Prabawanto, S. (2021). Mathematical Problem Solving Ability and Student Interest in Learning using Google Classroom. *Prosiding International Conference on Education of Suryakancana*, *1*(1), 155–161.

Simbolon, J., Nasution, H., & Simanjorang, M. (2022). Pengembangan Perangkat Pembelajaran Berbasis HOTS Menggunakan Model Pembelajaran Contextual

Teaching Learning untuk Meningkatkan Kemampuan Critical Thinking dan Self-Confidence. *Jurnal Cendikia: Jurnal Pendidikan Matematika* ,*6*(03), 2498–2514.

Situngkir, F. L., Saragih, S., & Napitupulu, E. E. (2023). Penilaian Dinamis pada Kemampuan Berpikir Kritis. *PRISMA*, *12*(2), 587–596. https://doi.org/10.35194/jp.v12i2.3263

Sukma, Y., & Priatna, N. (2021). Pengaruh self-efficacy terhadap kemampuan berpikir kritis siswa pada mata pelajaran matematika. *Jurnal Ilmiah Soulmath: Jurnal Edukasi Pendidikan Matematika*, *9*(1), 75-88.

Tari, D. K., & Rosana, D. (2019, June). Contextual teaching and learning to develop critical thinking and practical skills. In *Journal of Physics: Conference Series* (Vol. 1233, No. 1, p. 012102). IOP Publishing.

Trisnawati, Y. I., Sudargo, & Prasetyowati, D. (2019). Efektivitas Model Contextual Teaching and Learning dan Model Problem Based Learning untuk Meningkatkan Kemampuan Pemahaman Konsep Matematis Siswa SMP. *Imajiner: Jurnal Matematika Dan Pendidikan Matematika*, *1*(5), 190–200.

Wahyuni, R. (2016). Inovasi Pembelajaran Matematika dengan Model Pembelajaran Contextual Teaching and Learning (CTL). *JUPENDAS (Jurnal Pendidikan Dasar)*, *3*(2), 33-39.

Zuliyanti, P., & Pujiastuti, H. (2020). Model Contextual Teaching Learning (CTL) untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa SMP. *PRISMA*, *9*(1), 98–107. https://doi.org/10.35194/jp.v9i1.899