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Effectiveness of Contextual Teaching and Learning (CTL) through Differentiated Instruction on Students' Critical Thinking Skills in Economics

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ABSTRACT
Objective: *The study intends to analyze the effectiveness of CTL through differentiated instruction in students' critical thinking skills in economics subjects at one of Surabaya's high schools.* ***Method:*** *Using a quasi-experimental design that compares the experimental with the control class using pre- post-test activities, through a non-equivalent control group design. The experimentation was carried out over 4 meetings involving 2 classes in class X consisting of an experimental class (CTL through differentiated instruction) and a control class (PBL through conventional learning strategies). Pre- post-test data were collected, and ANOVA was used to analyzed the results.* ***Results:*** *Based on ANOVA, the critical thinking skills outcomes of students who received CTL treatment were higher compared to students who received PBL treatment. So that CTL learning through differentiated instruction is effectively used in upgrading students' critical thinking skills in economics subjects.* ***Novelty:*** *The novelty of this research when compared with existing research is by implementing CTL learning in collaboration with differentiated instruction to improving students' critical thinking skills, especially in economics studies. Considering that differentiation instruction is a new learning strategy that can be collaborated with learning models in schools that have implemented the Curriculum Merdeka, this shows the fact that this research has not been found by many other researchers before.*

INTRODUCTION

According to Indonesia's Law Number 20 of 2003 about National Education System, education helps people strengthen their skills and character formation of the nation's children. Curriculum Merdeka is an effort to improve the national education system (Mobonggi et al., 2023). With the direction of changes in education and curriculum in Indonesia, students are required to make several changes so that they can survive future educational developments (Lestari et al., 2021). The changes that students need to have been is critical thinking skills and problem solving, communication, and collaboration (Stanikzai, 2023). Students must acquire these skills because they can help them understand how knowledge can be applied in the 21st century. According to Ennis (2011) critical thinking is logical or thoughtful thinking with a focus on the actions of decision makers. One of the abilities that every learner has to possess is critical thinking (Dekker, 2020; Pardede, 2019) because critical thinking will help students solve various problems found in real life (Yayuk et al., 2020; Changwong et al., 2018; Haq & Sawitri, 2021). Then, critical thinking skills must be cultivated at all educational levels and applied to all subjects (Suciono et al., 2020; Pentury et al., 2023; Abrami et al., 2015).

In this case, critical thinking skills can be applied in economics subjects (Pühringer & Bäuerle, 2019). Economics is a complex and relevant subject in everyday life so it requires

high-level thinking skills in studying it (Andriyati & Noviani, 2023). However, in reality economic courses still fails to instill critical thinking in students. (Rahmadani, 2022). The author identified the lack of optimal critical thinking skills through observations carried out at one of Surabaya's High Schools. Based on information received by researchers through observation activities and direct interviews with economics teachers as well as data on HOTS assessment scores in economics subjects, students still have not fully reached the KKTP standards (Learning Goal Achievement Criteria) in economics subjects. Of the 120 students, only 31.6% reached the KKTP standard, while the rest did not. This reveal that the development of critical thinking abilities on economics subjects has not gone optimally.

The case of students' low critical thinking is generated by studying that is still directed and centered on the teacher, so that preventing students from being active during learning (Siregar & Narpila, 2023; Fardani et al., 2019). Apart from that, the scant tier of critical thinking skills is also generated by teachers still assuming that students have the same learning needs (Asri, 2022). In fact, a teacher must understand the criteria of each student in the class (Tomlinson, 2001). So, an educator needs to determine an appropriate learning strategy, method, model or approach because not all of them are suitable for implementation in classes that have different student characteristics. The form of strategy that can be implemented is the differentiated instruction which has begun to be apply in schools that implement the Curriculum Merdeka (Marlina, 2020).

Teachers utilize differentiated instruction to place students in groups according to learning preferences, interests, skills, and other factors. Differentiated instruction will be more effective if students can develop their understanding independently based on their experiences (Iswahyudi, 2023). In this case, differentiated instruction can be applied with an approach that is capable to enable students to conceive the material from the context of real-life experiences that they have experienced (Güth & van Vorst, 2023). So, teacher can use Contextual Teaching and Learning (CTL) in collaboration with differentiated instruction because the learning process in the classroom will be more meaningful if CTL can be integrated with differentiated instruction (Sapan, 2023). The combination of CTL and differentiated instruction will create a new learning atmosphere so that it is hoped that it can improve the quality of learning and the quality of students in critical thinking. Because according to Salamah & Ratnasari (2023), the differentiated CTL model is also able to improve students' HOTS abilities in learning. In this way, CTL will make the learning process in the classroom more meaningful and can be easily stored in students' memories (Toheri et al., 2020; Selvianiresa & Prabawanto, 2017).

Research gaps from various previous studies are the driving force behind this research. Based on research by Sapan (2023), it is stated that the application of differentiated instruction and CTL will form meaningful learning in the classroom. These findings have been clarified by research which states that CTL has an effect on improving students' critical thinking abilities (Yunita & Aufa, 2020; Munir & Nur, 2018; Lotulung et al., 2018). Other research also reveals that not only CTL, differentiated instruction are also able to create students' critical thinking skills. As in Lailiyah's (2016) research which

explains that students who receive differentiated learning treatment possess superior in critical thinking skills when compared with students who use regular learning. However, in the research of Primastuti et al. (2016) shows critical thinking skills and CTL learning is not statistically significant. This aligns with recent discoveries made by Ningsih et al. (2023) that it turns out that the conventional learning model has a more significant and shows a higher value of students' thinking skills when compared to CTL.

According to the researcher's explanation of the gap analysis, a number of previous studies generally confirm the idea that CTL and differentiated instruction have a good and substantial impact in students' critical thinking skills. But various other studies also state that CTL has no significant effect and shows lower scores in critical thinking skills. So, it can be said that there is an inconsistency in the results of previous research. The novelty of this research when compared with existing research is that it applies CTL learning in collaboration with differentiated instruction. Considering that differentiation instruction is a new learning strategy that can be collaborated with learning models in schools that have implemented the Curriculum Merdeka, this shows the fact that this research has not been found by many other researchers before.

Based on the explanation above, it was found that the study's objective was to analyze CTL's effectiveness through differentiated instruction on students' critical thinking skills in economics subjects.

RESEARCH METHOD

Research Design

The research applies quantitative methods and is experimental research. A quasi-experimental designs and non-equivalent control groups will be used to compare the experimental and control group using pre- post-test activities. As per this research, the experimental class received a CTL treatment and differentiated instruction. Meanwhile, the control class was received a PBL through conventional learning strategies.

Before treatment is carried out, the experimental and control group will be given pre-test questions. And in the experimental class a learning style questionnaire was also given and grouped based on the characteristics of each student according to the concept of differentiated instruction seen from the content or learning style of the students. Then, after giving the treatment, both classes will be given a post-test with the same questions as during the pre-test with the aim of assessing whether there has been an improvement after the treatment was given to the students. The research will be carried out over 4 meetings.

Sample of Research

In this research, 2 sampling methods were used, namely purposive sampling and census sampling techniques. The author used a purposive sampling technique with special considerations and criteria and tailored to the homogeneous abilities of students, Masyhud (2016). The sample was determined based on learning outcomes and also through discussions with class X economics teachers from a high school in Surabaya, Indonesia. The author has determined the students who will be used as samples based

on specific criteria using the purposive sampling technique and uses all students who meet these criteria, which in this case is called a census. This technique is deemed suitable for obtaining concrete and clear data regarding the use of studying methods in improving students' critical thinking skills. So, we got 2 classes that had special criteria with a total of 61 students to be used as samples. There were 29 students in the experimental group and 32 students in the control group as research samples and all students came from X class.

Instrument and Procedures

The research instrument used was pre- post-test. The pre- post-test questions used to measure critical thinking skills were developed by the research's himself in the form of essay questions totaling 6 questions which include 6 indicators of critical thinking skills as claimed by Facione (2015) which are; interpretation, analysis, inference, evaluation, explanation and self-regulation. The questions from the pre- post-test are identical. The questions need to be evaluated by a qualified and experienced assessor before being used for field testing. Experts were given a questionnaire to complete in order to validate the instrument, and the questions were categorized as appropriate for use. Following the validator's assessment of the questions, a different group of students than the experimental and control classes will undergo validity and reliability tests.

In this research, the Pearson Product Moment formula is applied to test the validity of the essay instrument. As well as using decision making if that t-count > t-table value is considered valid, and if that t-count < t-table then the item is considered invalid. Next, by making decision, the question's reliability is assessed by Cronbach's Alpha. An instrument is deemed reliable if Cronbach's Alpha value is > 0.60, and unreliable if it is falls below 0.60.

Testing the validity and reliability of pre and post-test items will use SPSS Version 22 program with the following results:

Table 1. Validity and Reliability of Pre-Test Post-Test Question Items

Test	**Item**					
Validity	1	2	3	4	5	6
(R_{XY})	0.458	0.650	0.730	0.532	0.697	0.484
Reliability	0.627					

Based on the analysis of question items carried out on 31 students, all question items were considered valid and significant with the coefficient for each question item being rxy > 0.40 and the reliability coefficient (> 0.60). The research procedures used by researchers are as follows:

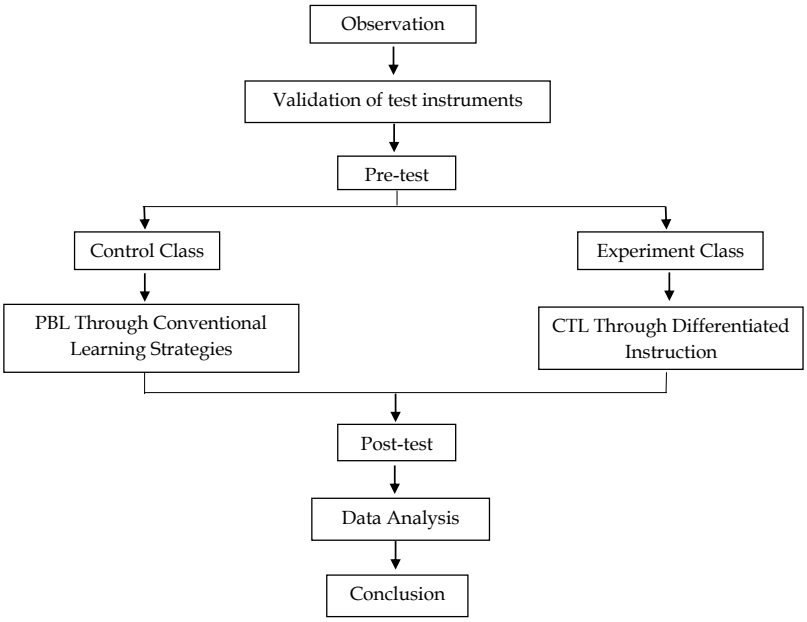

Figure 1. Research Procedure

Data Analysis

This study employed both inferential and descriptive statistics as methods of data analysis.

Inferential Statistical Analysis

Determining whether the grade of critical thinking skills differs between experimental and control group is the goal of inferential statistical analysis. To analyze pre- post-test data, normality, homogeneity and regression equation tests has to be carried out before using ANOVA inferential statistics.

A normality test will be carried out to determine whether or not the sample data follows a normal distribution before carrying out statistical tests. Normality test of experimental and control class data with the Kolmogorov-Smirnov test. The normality test shows that the significance value is 0.113 in the experimental group and 0.200 for the control group. Because the significance value is > 0.05, these finding states that data are normally distributed. Then, the homogeneity of variance was then ascertained using Levene's test. The variance homogeneity test demonstrates a 0.759 > 0.05 significance value, so the data is declared homogeny. After the data was said to be normal and homogeny, the linearity test of experimental and control group data was realized to shows whether the linear model obtained could be applied and show its influence to students' critical thinking skills. A significance value of 0.028 < 0.05 is displayed in the results, so it is said that the learning treatment in the experimental and control classes has an effect to students' critical thinking skills.

Subsequently, an ANOVA test was conducted to ascertain the disparities of students' critical thinking between the experimental and control classes. If it is known that there is a difference, then a regression test is realized to decide which learning treatment is more effective.

Descriptive Statistical Analysis

Descriptive statistical analysis was used to view and explore the average pre- post-test values of the experimental and control class and to analyze the effectiveness of CTL learning through differentiated instruction to upgrading students' critical thinking skills on economic studies. Data was obtained from the results of the pre- post-test.

RESULTS AND DISCUSSION

Results

The pre- post-test outcomes of the students in the experimental and control class is the research data. Before the treatment is carried out, students in experimental group are first given a learning style questionnaire to classify each student's learning style, namely visual, auditory or kinesthetic. Analysis of student learning styles is as follows:

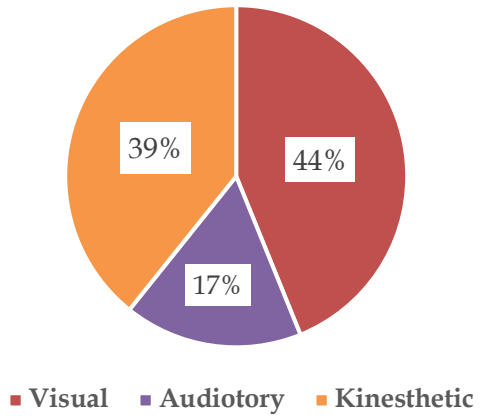

Figure 2. Percentage of Learning Syles Students Experimental Class

Based on the analysis's findings, 44% of the experimental class's students preferred the visual learning, 17% liked the auditory learning style, and 39% liked the kinesthetic learning style. So before giving treatment, teachers are able to adapt learning materials based on the learning preferences of their students. So, in this research, the following content or learning media differentiation grouping was obtained:

Table 2. Content Differentiation Based on Learning Style

Learning Style	Visual	Audiotory	Kinesthetic
Content	PowePoint, videos	Direct explanation	Practice Worksheet

The research results obtained from the pre- post-test of critical thinking skills grades from experimental and control class will be subjected to inferential statistical analysis and descriptive statistics. Researchers discover the results of inferential and descriptive statistical data analysis during their investigations. All data were calculated using SPSS Version 22 software, and produced the findings:

Inferential Statistical Analysis

To establish if the data is normal distributed and homogeneously, normality and homogeneity tests must be performed prior to doing statistical analyses. The normality

test in experimental and control group data with Kolmogorov - Smirnov and the test homogeneity of variance with the Levene test. Here are the results:

Table 3. Normality Test Experimental and Control Group Data with Kolmogorov – Smirnov Test

Test of Normality Kolmogorov – Smirnov			
	Statistic	Df	Sig.
Experimental Class	.147	29	.113
Control Class	.096	32	.200

Table 4. Levene's Test for Homogeneity of Variance

Levene's Test of Equality of Error Variances			
F	df1	df2	Sig.
.95	1	59	.759

As demonstrated by the table 3, test normality using Kolmogorov-Smirnov experimental and control class data shows 0.113 and 0.200 > significance level = 0.05. This suggest that the data for experimental and control group have a normal distribution. The Levene Test results in table 4 also show 0.759 > 0.05 as the significant value, indicating data is homogeny. Because the data is normally distributed and homogeny, the Independence Test can be carried out to show the effect of experimental and control class learning treatments to critical thinking skills. The outcomes of data analysis are obtained:

Table 5. Data Linearity Test for Experimental Class and Control Class

ANOVA					
Model	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
Regression	966.381	1	966.381	13.434	.001

From the results above, given that the significant value is 0.001 < 0.05, it can be said that both the experimental and control group learning treatments had an impact in the student's critical thinking skills.

Next, to ascertain how critical thinking skills of students differed between experimental and control group after being given different treatments, an ANOVA test was used. The ANOVA analyze findings are:

Table 6. ANOVA Test for Experimental and Control Group Data

Dependent Variable: Y						
Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	1549.683[a]	2	774.842	12.276	.000	.297
Intercept	3938.617	1	3938.617	62.400	.000	.518

PreTest	1135.520	1	1135.520	17.990	.000	.237
X	583.303	1	583.303	9.241	.004	.137
Error	3660.907	58	63.119			
Total	404622.000	61				
Corrected Total	5210.590	60				

a. R Squared = .297 (Adjusted R Squared = .273)

It is evident from the foregoing Tests of Between-Subjects Effects outcomes that the F scores for X (learning treatment) is 9.241 with Sig. of 0.004. Because the Sig value < α = 0.05, this shows that each students has different values for critical thinking skills between students who received PBL treatment and students who were given CTL treatment through differentiated instruction. So, by using a regression test, it can be seen which of the two learning treatments is more effective. The result is:

Table 7. Experimental Class Data Regression Test

Coefficients					
Model	**Unstandardized Coefficients**		**Standardized Coefficient**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
1 (Contstant)	52.660	11.358		4.636	.000
X	.728	.265	.468	2.752	.010

a. Dependent Variable: Y

Table 8. Control Class Data Regression Test

Coefficients					
Model	**Unstandardized Coefficients**		**Standardized Coefficient**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
1 (Contstant)	51.517	8.549		6.026	.000
X	.610	.191	.504	3.195	.003

Dependent Variable: Y

The two regression models show that the regression test constant for experimental class data is 52.660 and the regression test constant for control class data is 51.517, which means that the students' critical thinking skills in experimental and control group are different. And the regression direction coefficient (B) for the experimental group was 0.728 and in control group was 0.610 with a positive sign, indicating a linear association between the students' critical thinking skills and the treatment.

Descriptive Statistical Analysis

In the descriptive statistical analysis's findings, calculation of the average value and standard deviation for experimental and control group are:

Table 9. Descriptive Statistics of Pre- Post-Test Results of Critical Thinking Skills for Control and Experimental Group

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-Test Experimental	29	33	53	42.59	5.590
Post-Test Experimental	29	70	100	83.66	8.694
Pre-Test Control	32	33	63	44.16	7.684
Post-Test Control	32	60	97	78.44	9.298

The table shows a comparison of the pre- post-test outcomes in experimental group which received CTL learning treatment through differentiated instruction and the control class which received PBL learning treatment through conventional learning strategies. This table shows that the average post-test for the experimental class 83.66 points > the average post-test value for the control class, that is 78.44. This indicates that CTL through differentiated instruction is more effective to increasing students' capacity for critical thinking in economic material.

Discussion

The outcomes of research data analysis revealed that each students have a different critical thinking abilities in experimental group which was administering CTL learning treatment with differentiated instruction and control class which applied PBL with conventional learning strategies. Both the experimental and control groups received treatment over the course of four meetings.

Before to manage a treatment to experimental group, researchers had grouped and differentiated students according to their learning styles. Learning styles consist of visual, auditory, and kinesthetic. From results of the learning style grouping that has been implement, teachers can differentiate learning media or content. In this research, teachers apply learning media as PowerPoint and videos for students with a visual learning style, provide direct explanations for students with an auditory learning style, and practice worksheet for students with a kinesthetic learning style. Providing differentiated instruction treatment turns out to be very important to apply in the classroom. This is as explained in Al-Makahleh (2023) research which states that it is necessary to know students' learning styles in the teaching and learning process because through differentiated instruction, learning in the classroom will be much more meaningful and enjoyable (Anggoro et al., 2024). Then Simpson (2023) also revealed that differentiated instruction is an appropriate and effective strategy to implement to respond to the differences of various students in the class.

According to the results of inferential statistical data analysis through the ANOVA test, it is said that there's a significant distinction between CTL learning through differentiated instruction in experimental group and PBL through conventional learning strategies in control group. Apart from the ANOVA test, through the regression test it was discovered that the regression constant for the experimental class was greater than the control class. This demonstrates that students in experimental and control classes have different critical thinking skills. So, it was found that the value of critical thinking

skills applying CTL through differentiated instruction was greater than the value of critical thinking skills in PBL learning using conventional learning strategies. This means that CTL through differentiated instruction is more effective in upgrading students' critical thinking skills in economics studies when compared to PBL through conventional learning strategies.

This has been demonstrated by earlier research, including that conducted by Toheri et al. (2020) shows that problem-based learning is less successful than contextual studies in fostering thinking critically. This was also strengthened by research by Mayasari (2019) which revealed that students who were given CTL learning had higher critical thinking skills when compared to classes that used PBL learning. This was made clear in research by Khotimah & Masduki (2019) which also stated that CTL learning was able to impact the ability think critically and had a favorable impact on student capacity for critical thought (Wahyuningtyas & Wuryadi, 2018).

Then, the findings of descriptive statistical analysis indicating the average post-test value for the experimental group was higher than the average post-test score for the control group. These findings show that CTL through differentiated instruction is effective to upgrade students' critical thinking skills in economic subject. These results are reinforced by research by Sapan (2023) it declares that the use of differentiated instruction and CTL will form meaningful learning in the classroom so that enhance student's capacity for critical thought (Yunita & Aufa, 2020; Lotulung et al., 2018).

The following conclusion can be drawn from the research findings mentioned above that CTL through differentiated instruction is effectively applied to improving students' critical thinking skills on economics subjects. So that teachers can use CTL and collaborate it with differentiated instruction. From these findings, further research must be carried out and can be repeated using the concept of other differentiation learning strategies, not only through students' learning styles. The alternative is to use process-based differentiation and product differentiation according to students' learning interests.

CONCLUSION

Fundamental Finding: The following conclusion can be drawn from the research findings that CTL learning through differentiated instruction is effectively applied to upgrading students' critical thinking skills on economics studies. **Implication:** The critical thinking skills scores of classes who receive CTL treatment through differentiated instruction are higher when compared to students who given PBL treatment through conventional learning strategies. **Limitation:** This research limits the use of the concept of differentiated instruction where the application only uses one of the three differentiated instruction concepts, namely content differentiation. **Future Research:** Further research can be carried out using other concepts of differentiation instruction, not only through students' learning styles, which alternatively can use process-based differentiation and product differentiation according to students' learning interests. So that future research can discover the effectiveness of CTL learning through differentiated instruction and its relevance in economics subjects or other subjects.

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