

## The Effect of Blended Learning with Higher Order Thinking Skills Approach on Students' Critical Thinking Skills

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### Abstract

*The study examines how blended learning impacts student's critical thinking skills. This type of research quantitative with the Quasy Experiment method using a time series design. The number of research samples was thirty students, who were drawn from two classes. The instruments used were essay questions, questionnaires for critical thinking variables, blended learning with the HOTS approach, and field notes. The results indicate that integrating a blended learning model with HOTS techniques enhances student's critical thinking skills. The findings of the ANOVA test, which produced a F value of 5.851 with a significance level of 0.036, corroborate this conclusion. The results of the proposed hypothesis are accepted because the F count is greater than the F table. Namely  $5.851 > 4.196$ . The study's findings affirm that blended learning models combined with HOTS techniques positively affect students' critical thinking abilities.*

**Keywords:** Blended Learning, Critical Thinking, HOTS.

### INTRODUCTION

Education plays an active role in ensuring human survival in this modern and sophisticated era of globalization (Fahrurrozi et. al., 2021; Hashim et. al., 2022; Mohzana et. al., 2021; Mui et. al., 2022). Education in this era of globalization, students are encouraged to face the challenges of industry 4.0, which requires the development of students' skills or what is known as the 21st century (Komalasari, 2021; Laksana, 2021; Rahmawati & Atmojo, 2021; Wiseman, 2022). To achieve success in the era of globalization, 21st century skills are essential for navigation global market changes, international competence, migration, political environment, and technological developments (Angga et.al., 2022; Aslamiah et.al., 2021; Karpov & Karpova, 2022; Mui et.al., 2022). 21st century skills include critical thinking skills, digital literacy, media information and understanding and mastery of information and communication technology (Abaniel, 2021; Mui et al., 2022; Pelu, 2021; Yap et al., 2021).

Critical thinking involves the ability to interpret and assess information, and encompasses active observation, communication, data handling, and constructing arguments. In addition, critical thinking also the capacity for scientific reasoning that is intelligent, independent, clear, and rational (Angelico, 2021; Indrašienė et.al., 2021; van der Zanden et. al., 2020; Yulian, 2021)

So critical thinking is the ability to think rationally in solving problems, making conclusions, various possibilities and deciding on problem solving appropriately (Bangun & Pragholapati, 2021; Palavan, 2020). The ability to think critically allows a person to compile thoughts based on their experiences so that they can examine problems to solve problems that occur to themselves and others (Arisoy & Aybek, 2021; García-Moro et al., 2021). Now, critical thinking is considered an essential life skill that needs to be developed. Students must practice critical thinking to research, analyze, and study the subject matter (Arisoy & Aybek, 2021; Grigg & Lewis, 2022; Santos, 2017). Critical thinking is a crucial skill required to navigated the revolution. Therefore, in

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the industrial revolution, critical thinking must be an essential skill for students at all levels of education (Grigg & Lewis, 2022; Mena Araya, 2020; Ostendorf & Thoma, 2022; Santos, 2017).

Based on observations that have been made during the learning process, the majority of teachers still rely on the (conventional) lecture method that is teacher-centred and question and answer. The teacher-centred learning pattern causes students to be less active in the learning process because the teacher dominates. So this method can only be used during the face-to-face learning process between students and teachers. This has an impact on students' very low critical thinking skills. Thus, it can be said that the average Indonesian student lacks critical thinking skills.

To encourage students' critical thinking, modern methods are needed in accordance with current developments. The Higher order thinking skills (HOTS) learning method is the latest learning that can be used to improve the learning process (Ballakrishnan & Mohamad, 2020; De Mello et al., 2021; N. A. B. Musa & Othman, 2021). HOTS is the ability to manipulate or process information/ideas in a critical and creative way in order to solve a problem that involves analysis, evaluation, and creation (Goik Leng et al., 2020; Hidayat, 2020; Jaenudin et al., 2020).

All HOTS components are part of critical thinking skills. Problem solving is the highest level of HOTS which is founded or built on critical thinking which is the main basis of HOTS (Jaenudin et al., 2020; M. Musa & Samsudin, 2021; Umami et al., 2021; Wilson & Narasuman., 2020). High-level thinking skills or HOTS can be honed through interactive and activity-based classroom learning because it can build students' critical thinking skills, such as problem-solving learning methods. To maximize the performance of HOTS learning methods, the blended learning model is suitable because it is technology-based (Chaiyama, 2019; Hariadi et al., 2021).

Blend-based learning combines face-to-face and online learning (Graham, 2009; Valiathan, 2002). The aim of the blended learning approach is to optimize the use of written communication from online learning and oral communication from face-to-face teaching. Multimedia technology, video streaming, online courses, CD ROMs, voicemail, email, conference calls, and online text animation are all part of blended learning. It is all included in the conventional classroom simulation model (Babić, 2012; Mystakidis et.al., 2019; Sophonhiranrak et.al., 2015). Blended learning is an educational method that integrates conventional classroom teaching with practical, experiential learning. This method makes use of online educational resources that can be accessed by teachers and students (Berga et.al., 2021; Calderón et.al., 2021; Finlay et.al., 2022; Sefriani et.al., 2021). Blended learning aims to provide opportunities for learners to learn independently, sustainably and develop lifelong (Graham et al., 2013; Mystakidis et al., 2019; Valiathan, 2002).

Blended learning is primarily student-centred. It is hoped that students can be independent and responsible in their learning. The blended learning atmosphere requires students to actively participate in learning inside and outside the classroom (Berga et. al., 2021; Calderón et. al., 2021; Finlay et. al., 2022; Sumarmi et.al., 2021). Blended learning is not fully online learning that replaces face-to-face learning in the classroom. Instead, it is used to complete and answer material that has not been delivered in class (Graham et.al., 2013; Hariadi et.al., 2021; Mohzana. Fahrurrozi., Muh, ,2021; Resien et.al., 2020).

Blended learning is essential to encourage more interesting, effective, and efficient learning. The advantages of face-to-face teaching can be used to overcome the disadvantages of online learning. On the other hand, the advantages of online learning can make up for the shortcomings of face-to-face teaching. The suitability of strategy delivery between online and face-to-face learning is the key to success for the quality of blended learning implementation (Ashraf et.al., 2021; Chiu, ,2021; Jost et.al., 2021; Yin & Yuan, 2021).

Similar research was conducted by (Wahyunita & Subroto, 2021) and found that (1) students' critical thinking skills increased significantly, (2) the learning implementation went well, (3) The HOTS learning model is effective in improving student learning outcomes and improving students' critical thinking skills. Thus, it was concluded that students' critical thinking skills improve effectively and significantly using the HOTS learning model.

Many similar studies have been carried out, among others, by (Anggraeni et al., 2019) have researched the impact of blended learning on high school students' critical thinking regarding temperature and heat. The results indicate that blended learning significantly affects student's critical thinking abilities in these topics.

The research conducted by (Hamdani et al., 2022) examines how effectively students' critical thinking skills are enhanced through the HOTS-based problem-based learning approach. According to the collected data, the experimental class had an average score of 72, compared to 55.5 for the control class. With a P-Value of 0.000 from the t-test, the null hypothesis is rejected. This demonstrates that students who are taught using the HOTS-based learning model and students who follow the standard learning model have significantly different critical thinking abilities.

Based on this research, the researcher intends to conduct a study to evaluate whether blended learning with a HOTS approach can effectively enhance critical thinking skills. The hypothesis that can be developed is as follows: Blended learning with a HOTS approach effectively enhances students' critical thinking skills.

## **Research Method**

The implementation of this research is in the odd semester of 2022 – 2023. This study uses an experiment method that aims to see how a variable affects other variables or how the causal relationship between one variable and another variable. This study uses the Quasi Experimental research method. The research design does not require a control group but only utilizes one group. The experimental group received a pretest before being given therapy, then given treatment with a blended learning model of the HOTS method, then a posttest. The critical thinking ability of the blended learning model is measured by indicators; (1) students' response to the learning model, (2) students' activeness, (3) teachers' learning implementation, and (4) students' learning outcomes.

This study involved a population of 62 individuals from a single class. Sampling uses area or cluster sampling which is one of the non-probability sampling techniques. Sampling is done by drawing lots so that all homogeneous classes have the same opportunity to become samples in the study. The class that appears first in the draw will be the experimental class. Posttest was conducted in an experimental classroom after the blended learning method to evaluate its impact on students' critical thinking skills. After that, the name of the group whose name appears will be the sample in this research which appears by name totaling 30 students. Blended learning is the independent variable employed in this study. Critical thinking, however, is the study's dependent variable.

This study collected data using questionnaires and test instruments. The questionnaire used consisted of 35 question items. The answer in each questionnaire item uses a Likert scale which has a very positive to very negative gradation provided in 4 alternative answers. While the test used in this study is an achievement test.

The validity test of the test instrument and questionnaire in this study will use the same formula, namely the Pearson Product Moment formula. Reliability test in this study, researchers will look for the reliability of a test using the KR-20 formula. Calculating differentiating power is measuring the extent to which a question item is able to distinguish between clever children and less clever children based on certain criteria. The higher the differentiating power value of an item, the more able the item is to differentiate between the smart and the less smart. The level of difficulty of the blended learning variable has questions that are classified as easy as 4 questions out of 12 questions, classified as medium as 3 questions, while classified as difficult (difficult) as many as 5 questions.

The data analysis technique involves both prerequisite tests and hypothesis testing. The prerequisite tests include the normality test, which uses the one-sample Kolmogorov-Smirnov test, and the homogeneity test, which employs Bartlett's test statistics. For hypothesis testing, the Simultaneous Significance Test (F Statistics) is used.

**RESULTS AND DISCUSSION**

**Data Description of Pretest Results, Critical Thinking Posttest, and Blended Learning Results**

**Table 1. Critical thinking pretest data**

Descriptive Statistics						
	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Critical Thinking	30	50.00	82.00	67.0000	1.26763	6.94312
Valid N (listwise)	30					

The results of the data description, it shows that the minimum value of the critical thinking variable during the pretest is 50.00, meaning that there are students who have a value far from the predetermined KKM of 75.00. The maximum value is 82.00, meaning that there are students who have a value that exceeds the KKM of 75.00. this shows that there are some students who already have a foundation for critical thinking. The average value (mean) of 67, meaning that some students already have a foundation for critical thinking. For the standard deviation value of 6.94, it means that the sample used in this study is diverse.

**Table 2. Critical thinking posttest data**

Descriptive Statistics						
	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Critical Thinking	30	77.00	96.00	85.1000	.97715	5.35209
Valid N (listwise)	30					

From tables 1 and 2, it is evident that there is a significant difference between the results of the pretest and posttest, this is indicated by the minimum student score of 77 which means it is greater than the predetermined KKM of 75. Meanwhile, the maximum posttest score is 96 which means that after implementing the blended learning model with the HOTS approach, students have successfully enhanced their critical thinking. Conversely, the average score of 85 indicates that, on average, pupils have made progress in developing their critical thinking abilities. While for the standard deviation of 5.3 shows that after using the HOTS approach combined with the blended learning paradigm, students' critical thinking skills improve.

**Table 3. Blended Learning Data**

Descriptive Statistics						
	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Critical Thinking	30	60.00	90.00	75.00		11.06408
Valid N (listwise)	30					

The blended learning variable has a minimum value of 60.00, according to the data description results, meaning that there are students who have scores that are far from the predetermined KKM of 75.00. while for the maximum value of 90.00, meaning that there are students who have scores that exceed the KKM of 75.00. As for the average value (mean) of 75, it means that some students already have a foundation for critical thinking. For the standard deviation value of 11.06, it means that the sample used in this study is diverse. The frequency distribution of data demonstrating students' development of critical thinking abilities both before and after the blended learning model using HOTS technique is presented below.

**Table 4. Pretest and Posttest Frequency Data**

No	Pretest		Posttest	
	Value Interval	Frequency	Value Interval	Frequency
1	50-59	2	75-79	3
2	60-69	12	80-84	10
3	70-79	14	85-89	9
4	80-89	2	90-94	6

5	90-99	0	95-99	2
Total		30	Total	30

Table 4 shows that 3 students obtained scores ranging from 75 to 79. A total of 10 students obtained scores that ranged from 80-84. A total of 9 students obtained scores ranging from 85-89 and 6 other students obtained scores ranging from 90-94. While 2 students obtained scores ranging from 95-99 This shows that 80% of students have been able to improve students' critical thinking skills, because a blended learning model with a HOTS approach has been applied and the average student has a score that exceeds the predetermined KKM of 75.

### Normality Test, Homogeneity Test and Hypothesis Test

The following are the results of the normality test SPSS output as follows:

**Table.5. Normality Test.**

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		30
Normal Parametersa,b.	.Mean.	.6791600
	.Std. Deviation.	5.27252447
Most Extreme Differences.	.Absolute.	.181
	.Positive.	.181
	.Negative.	-.081
Test Statistic.		.181
Asymp. Sig. (2-tailed) .		.135c
a. Test distribution is Normal. .		
b. Calculated from data. .		
c. Lilliefors Significance Correction. .		

Table 5 shows that Kolmogrov-smirnov Z is 0.181 and significance at 0.135. Since the significance result is greater than 0.05 ( $0.135 > 0.05$ ), it can be concluded that the data distribution in this study follows a normal distribution.

In this study, the Levene method was used to test the homogeneity of the data. The data is regarded as homogenous if the significance value is larger than 0.05, and non-homogeneous if it is less than 0.05. Table 6 displays the outcomes of the homogeneity test data processing.

**Table 6. Homogeneity Test**

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Critical Thinking	Based on Mean	1.053	3	26	.386
	Based on Median	.667	3	26	.580
	Based on Median and with adjusted df	.667	3	20.734	.582
	Based on trimmed mean	1.007	3	26	.405

Table 6 shows that the posttest results for students' critical thinking skills have a significance value of 0.386, which exceeds 0.05, which means that  $H_0$  is accepted, This shows that the two groups belong to a homogeneous population that has similar variants. After fulfilling these analytical requirements, hypothesis testing can be carried out to fulfil whether the proposed hypothesis is accepted or rejected, this can be done with the f test.

**Table 7. Simultaneous test results (Anova)**

ANOVAa						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	24.514	1	24.514	5.851	.036b
	Residual	806.186	28	28.792		
	Total	830.700	29			
a. Dependent Variable: critical thinking						
b. Predictors: (Constant), Blended Learning						

Table 7 shows a calculated F value of 5.851, a significance of 0.036. So to find out whether the hypothesis proposed is accepted or rejected, we need to compare the F count with the F table. To find the F table, we can use the formula  $df = n - k - 1$ . or  $df = 30 - 1 - 1 = 28$ , then we find the F table of 4.196. This means that  $F \text{ count} > F \text{ table}$  or  $5.851 > 4.196$ .

## DISCUSSION

The purpose of this study was to determine how students' critical thinking abilities regarding employment materials are impacted by the blended learning model with the HOTS technique. The achievement of the first test results (pretest) and the last test results (posttest) was used to gauge the critical thinking abilities of the students. The instrument used consisted of 5 description questions. The test instrument has been tested first, namely by testing validity, reliability, distinguishing power, and difficulty level. The correlation value of validity and reliability highly qualifies data. This shows that the question is valid and reliable for assessing students' critical thinking abilities. The sample studied was 1 class consisting of 30 students. Each of these students was given an initial test question (pretest) after checking that the results found were still many who did not meet the KKM. Then all class XI students were given the treatment of the blended learning model with the HOTS method with 4 (Four) meeting sessions, after which a posttest was conducted with the same question in order to see the extent of the student's understanding.

Critical thinking abilities among students on labor material are still rather low. The first test's (pretest) results demonstrate how low these talents are. The average student pretest score is 67. This shows that the average pretest score is still below 60% of the maximum score is 100. In this study, the lowest student score on the pretest was 50 and the highest score was 82. This shows that the initial ability of students can be said to be low because it is still far from the predetermined KKM of 75. The low initial ability of each student is caused by several factors, one of the causes of low critical thinking skills is due to low understanding of concepts in learning materials. The low understanding of these concepts is due to students' lack of concentration, resulting in a lack of seriousness in learning and a reduced understanding of the material. This causes the optimization of critical thinking skills to be hampered.

Students' critical thinking skills based on pretest results on critical thinking aspects are classified as low In the aspect of providing elementary clarification, the average student who answers correctly is 50%. It is because students struggle to comprehend the significance of the questions pertaining to the topic being taught that they have inadequate critical thinking skills in the elementary clarification area. In the basic support aspect (building basic skills) students who answered correctly were 45%. Students struggle to comprehend the findings of labor-related observations, which contributes to their low critical thinking proficiency in the basic support area (developing basic abilities). In the inference aspect, students who answered correctly were 35%. The reason for the restricted advancement of students' critical thinking abilities in the domain of inference is their incapacity to differentiate between conclusions linked to and unrelated to labor. In the aspect of advance clarification (providing further explanation) students who answered correctly were 45%. Because students struggle to distinguish between assumptions that pertain to labor and non-labor, their critical thinking abilities are lacking in this area. In the aspect of strategy and tactics, students who answered correctly were 40%. The reason for the inadequate critical thinking abilities in the strategy and tactics area is that students struggle to make decisions about how best to allocate labor.

The pretest results showed that the aspect with the highest percentage was elementary clarification (50%). The lowest percentage was in the inference aspect (35%). This is in accordance with Dewi Anggraini's research

where the inference aspect is (44%). The final ability of students' critical thinking skills based on the posttest results has increased. The final ability of critical thinking skills that have been given the treatment of blended learning model with HOTS approach is high with an average of 85.00. This can be seen from the highest score of 96. The increase occurred because students began to get used to being given questions that had critical aspects, so that in working on the questions it already felt lighter than the first time they were given the questions. By using blended learning model with HOTS approach, students will also get additional information, which is explored through other sources such as deepening materials, learning videos and others. This is consistent with research by Hamdani 2022, which found that students in the experimental class had higher critical thinking final abilities.

In the aspect of providing elementary clarification, the average number of students who answered correctly was 80.00%. In the aspect of elementary clarification (providing basic explanations) occurs at the let me stage (practice/practice). At this stage students conduct discussions and try to explore the basic knowledge that students have related to labour by answering the package book provided by the teacher. At this stage many students answered correctly, because in the pretest question students only focused on the question, not seeing the meaning of the picture in the question. This demonstrates the ability of the kids to define labor. In addition, it is because they are used to answering questions by identifying pictures, diagrams, and symbols based on the information contained in the question.

In the area of developing fundamental abilities (basic support), 60% of pupils provided accurate responses. This happened because there were obstacles in the form of students not understanding the learning at the Check me stage. At this stage the teacher tests students with the material that has been tested, but the results obtained are not too significant because there are some students who do not understand, so the basic skills that occur are not optimal.

In the aspect of inference, students who answered correctly were 65% in the aspect of inference (concluding) occurred at the Support me stage. Of the pupils that responded correctly when asked to provide extra explanation (advance clarification), 70%. In the aspect of advance clarification occurs at the Coach me stage, students can be independent but still need input from the teacher. In the aspect of strategy and tactics (organising strategies and tactics) students who answered correctly were 70%. In the aspect of strategy and tactic occurs at the Connect me stage. The highest aspect in this study is elementary clarification, providing simple explanations and providing strategies and tactics. This aligns with the findings of Anggraini's research.

The findings demonstrated a difference in the test scores of the students before and after they received instruction using the HOTS approach in blended learning. In terms of aspects, the highest increase in elementary clarification occurred because students were able to provide a simple explanation of labor and were able to ask and answer questions during the discussion process. This is in accordance with the explanation of someone who has critical thinking skills is the skill to say something confidently, have a good idea because it is based on logical reasons.

The aspect of critical thinking that experienced the lowest increase was in basic support (basic ability). This happens because the initial ability of students who have partially understood the assumptions or information provided so the increase is not too high. Another factor is a lack of understanding of the content of the problem, still having difficulty in analyzing and understanding information, and many students are used to learning by only receiving information from the teacher so that when they are faced with providing further explanation of a problem, some have difficulty. Students' interest in the blended learning model is consistent with earlier research by Anggraini, whose findings indicate that students' critical thinking abilities are impacted by blended learning using the HOTS technique. The value of the students' posttest results following the use of the blended learning model and the HOTS technique indicates this; it is greater than the KKM, which is 77–96. This suggests that students' average thinking abilities varied between the pretest and posttest.. This difference occurs because before and after being given a blended learning model with a HOTS approach. Additionally, it is evident from the ANOVA test results that the computed F value of 5.851 with a significance level of 0.036 had an ANOVA value of 5.851. Therefore, we must compare the F count with the F table to determine if the proposed hypothesis is accepted or rejected. then 4.196 is found in the F table. This means that F count > F

table or  $5.851 > 4.196$ . This shows that blended learning with the HOTS approach effectively enhances students' critical thinking skills.

The benefits of the blended learning approach in this study include the ability of students to engage in discussions with teachers or other students outside of learning hours and the freedom of students to learn the material independently that is available online. This means that students can ask questions with researchers related to learning materials outside of students on polite terms. In addition, researchers can add enrichment material through available internet facilities. There are many drawbacks to this study's use of the blended learning paradigm and HOTS technique, including the following: Stable and adequate internet is the main factor to support the Blended Learning model, the condition of mobile phones owned by students must have adequate storage, and independent asynchronous activities are not fully controlled, only emphasizing students' honest attitude.

## CONCLUSION

The posttest findings showed that the students' critical thinking abilities had finally improved. The final ability of critical thinking skills that have been given the treatment of blended learning model with HOTS approach is high with an average of 85.00. The findings of the posttest demonstrate how successful the blended learning model with the HOTS approach is at helping students develop their critical thinking abilities. The Anova test produced an estimated F value of 5.851 and a significance level of 0.036. In order to determine the acceptance or rejection of the presented hypothesis, we must compare the F count and F table. then discovered the 4.196 F table. This indicates that  $5.851 > 4.196$ , or  $F \text{ count} > F \text{ table}$ . This demonstrates how well blended learning using the HOTS technique helps students develop their critical thinking abilities.

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