PAPER NAME

THE EFFECT OF PROBLEM-BASED LEAR
NING METHOD ON STUDENTS_ CRITICA
L THINKING ABILITY.pdf

WORD COUNT

7861 Words

CHARACTER COUNT

41195 Characters

PAGE COUNT

14 Pages

FILE SIZE

817.3KB

SUBMISSION DATE

Apr 7, 2023 4:18 PM GMT+7

REPORT DATE

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THE EFFECT OF PROBLEM-BASED LEARNING METHOD ON STUDENTS' CRITICAL THINKING ABILITY

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Abstract: The purpose of this study was to determine the effect of using problem-based learning methods on students' critical thinking ability with emotional intelligence as a moderating variable in 11th Grade Students of Social Studies at Al Islam Boarding School Senior High School, Kondangsari Village, Beber Sub District, Cirebon District. The research method used was a quasi-experimental with a factorial design. The subjects of this study were 66 students of 11th Grade Students of Social Studies (XI IPS) at Al Islam Boarding School Senior High School, Kondangsari Village, Beber Sub District, Cirebon District where the XI IPS 2 class was the experimental class and the XI IPS 3 class was the control class. The data analysis technique used the two-way ANOVA test. Based on the research results, it was known that there a significant effect of using problem based learning methods on critical thinking ability, there is significant effect of emotional intelligence on critical thinking ability, and there is significant interaction effect between the using problem based learning methods and emotional intelligence on students' critical thinking ability of 11th Grade Students of Social Studies at Al Islam Boarding School Senior High School, Kondangsari Village, Beber Sub District, Cirebon District. Therefore that emotional intelligence moderates the effect of using problem based learning methods on critical thinking ability.
Keywords: *problem based learning methods; emotional intelligence; critical thinking ability*

INTRODUCTION

The implementation of the ASEAN Economic Community (AEC) requires readiness in all aspects including human resources. Therefore, the quality of Human Resources (HR) needs to be improved through formal and informal education. Building quality education is the key to producing quality human resources, who are skilled in science and technology, and are competitive.

One of the skills needed to face the MEA is the ability to think critically. Paul in Itmeizeh & Hassan (2020) defined critical thinking as "the art of analysing and evaluating thinking with a view to improving it." Duron, Limbach, and Waugh in Rachmawati (2018) categorized critical thinking as an ability that includes the ability to analyze, synthesize, and evaluate Bloom's taxonomy, so critical thinking is classified as a higher order thinking ability.

The benefits of critical thinking skills according to Jessica (2018) are increase sensitivity, save time,

respect differences of opinion, improve communication skills, and become wiser. Sharpening students' critical thinking skills is very important to be developed in schools so that students are able and accustomed to dealing with various problems around them. In the learning process, students' critical thinking skills can be honed and developed through appropriate teaching by means of students getting used to finding problems, analyzing problems, making hypotheses, collecting data, testing hypotheses, and determining alternative solutions. Someone who has critical thinking is able to help himself in dealing with mental or spiritual questions and can evaluate a person or group to solve social problems that occur (Duron, Limbach, and Waugh in Eryadini and Nafisah, 2017).

Based on a pre-research conducted in class XI IPS SMA Al Islam Boarding School, Kondangsari Village, Beber District, Cirebon Regency, to measure the extent to which students' critical thinking skills are in economics subjects, pre-

research questions were in the form of descriptions amounted to 5 questions using indicators of critical thinking skills. The results of the student's critical thinking ability test on economics class XI IPS at SMA Al Islam Boarding School for the academic year 2020/2021 with reference to the criteria for the Benchmark Reference Assessment (PAP) scale 5 can be explained in table 1 as follows:

Table 1. *The results of the student's critical thinking skill test in the Economics subject of class XI IPS SMA Al Islam Boarding School for the 2020/2021 Academic Year*

Score	Category	Frequency	Percentage
90 – 100	Very High	0	00,00%
80 – 89	High	0	00,00%
65 – 79	Medium	13	19,70%
55 – 64	Low	16	24,24%
0 – 54	Very Low	37	56,06%
TOTAL		66	100,00%
Mean		-	51,21

Table 1 shows the critical thinking skills of students in economics in class XI at SMA Al Islam Boarding School which is still in the very low category where the frequency of students in the very low category is students whose score between 0-54, the frequency of students is 37 people with a percentage of 56.06%. Furthermore, in the low category, students who scored between 55 – 64, the frequency of students amounted to 16 people with a percentage of 24.24%. As for the medium category, students who scored between 65 – 79, the frequency of students only amounted to 13 people with a percentage of 19.70%. For the high category with a value between 80-89 and the very high category with a value between 90-100, the frequency of students was zero, which means that no students achieved a score above 80. The average student only reached 51.21 in the category of not passing because it is less than 65.

Students' critical thinking ability is one of the objectives of the 2013 curriculum. The 2013 curriculum has been applied to senior high schools (SMA) at Al Islam Boarding School Senior High School, Kondangsari Village, Beber District, Cirebon Regency. The results of interviews conducted by researchers to the Economics Subject Teacher of XI IPS SMA Al Islam Boarding School, namely Mrs. Siti Soebah, S.E showed that students' critical thinking skills were still low. This means that there are still problems in learning economics in the classroom. In the learning process, teachers cannot create conditions and situations that allow students to carry out critical thinking processes. This can be seen from the activities of teachers and students during teaching and learning activities. The method most often used by teachers to activate students is to involve students in discussions with the whole class, from teacher to student and from student to teacher. In addition, based on interviews conducted with students that in economics learning the teacher is only oriented to the material without paying attention to the learning objectives. Based on the conditions of these learning activities, students are not trained to think critically.

The use of learning methods that are still teacher-centered can increase students' knowledge. However, because students are not accustomed to building their own knowledge, the level of knowledge only reaches low-level thinking skills, while critical thinking skills are higher-order thinking skills, one of which can be measured by questions with high cognitive categories in Bloom's taxonomy (Jessica, 2018).

The low critical thinking ability of these students is important to study. If the problem continues, it will have an impact on the inability of students to solve the problems they face. So far, students are only accustomed to fully receiving information without trying to find alternative answers and are accustomed to dealing with questions with low cognitive level categories. As stated by Iskandar & Mulyati (2019), teachers orienting to the completeness of material using simple method will only cause students to tend receiving more information and less afford the opportunities to develop their critical thinking ability.Furthermore, if in the learning process students are not accustomed to thinking critically, it is feared that the output of Indonesian education cannot apply the knowledge gained in real life and these students will find it difficult to develop even though their academic scores are good (Jessica, 2018).

The paradigm shift from teaching to learning requires the hard work of teachers in providing the best education to students so that they are able to develop themselves and are ready to enter the community. According to Slameto (2010), teachers must use many methods in teaching because variations in methods result in the presentation of lesson materials that attract students' attention, are easily accepted by students and the class comes alive. Teachers who are able to apply the method well will

certainly produce good quality students as well. The teacher certainly does not just convey the subject matter, but also transfers moral values. Cooper in Sianturi (2018) asserts that a teacher is a person charged with the reasonability of helping others to learn to behave in new different ways. A teacher needs more teaching skills than people who are not teachers. Teachers must be rich in teaching methods and strategies. Therefore, teachers must have broad knowledge and insight.

Referring to the description, it is necessary to make an effort to overcome the low critical thinking ability of students. To develop students' critical thinking skills in teaching and learning activities, learning methods must be developed, not only increase knowledge but also make students more active, able to understand the material in accordance with learning objectives, and be responsive to problems that exist in the surrounding environment.

One of the learning methods that can be used to overcome the low critical thinking skills of students is Problem-based Learning (PBL). The principle of learning the PBL method is by providing problems as the first step in the learning process, the problems presented are problems that are often encountered in daily life, because it has better effect on improving learning outcomes. Here the task of the educator as a facilitator who directs students in finding the solutions needed. In addition, problem-based learning can help to improve lifelong learning skills in an open, reflective, critical, and active learning mindset (Rusman, 2012).

PBL method is one of the learning methods that can be used to overcome the low critical thinking ability of students because it has several advantages, namely: students are encouraged to have problem solving skills in real situations; students have the ability to build their own knowledge through learning activities; problem-focused learning so that unrelated material does not need to be studied by students, this reduces the burden on students by memorizing/retaining information; scientific activities occur in students through group work; students are accustomed to using sources of knowledge both from the library, internet, interviews, and observations; students have the ability to assess their own learning progress; students have the ability to carry out scientific communication in discussion activities or presentations of their work; and individual student's learning difficulties can be overcome through group work in the form of peer teaching (Thobroni in Rachmawati, 2018).

The main purpose of the PBL method is the development of critical thinking skills, problem solving abilities, and the ability of students to actively build their own knowledge. The PBL method is also intended to develop students' learning independence and social skills. Learning independence and social skills can be formed when students collaborate to identify relevant information, strategies, and learning resources to solve problems (Hosnan, 2014).

In addition to the use of appropriate learning methods, students' emotional intelligence is also a driving factor to achieve critical thinking skills. Emotional intelligence is a person's ability to manage his emotions. Emotional intelligence is related to students' ability to recognize their own emotions, manage their own emotions, motivate themselves, recognize the emotions of others (empathy), and the ability to build relationships with others. Managing these emotions will be able to affect various daily activities, including also in learning activities (Sulistianingsih, 2016).

The importance of emotional intelligence is felt when a person interacts with other individuals or groups. A person is expected to be able to control his emotions with good and positive emotional management. In managing these emotions, of course, a person is required to be able to have good emotional intelligence. This emotional intelligence can affect a person's critical thinking ability. The better the emotional intelligence a person has, the more likely it is that the person's ability to think critically will be better (Sulistianingsih, 2016).

Based on this explanation, it can be assumed that the problem-based learning method has an effect on students' critical thinking skills with emotional intelligence as a moderating variable. For this reason, the researcher conduct a research with the title: " The Effect of Using Problem-based Learning Methods on Students' Critical Thinking Ability with Emotional Intelligence as a Moderating Variable", with the formulation of the problem: (1) Is there any effect of using the problem-based learning method on the critical thinking skills of the XI IPS class students of SMA Al Islam Boarding School, Kondangsari Village, Beber District, Cirebon Regency? (2) Is there an influence of emotional intelligence on the critical thinking ability of students of class XI IPS SMA Al Islam Boarding School Kondangsari

Village, Beber District, Cirebon Regency? (3) Is there an interaction effect between the use of problem-based learning methods and emotional intelligence on the critical thinking skills of XI IPS class students of SMA Al Islam Boarding School, Kondangsari Village, Beber District, Cirebon Regency?

METHOD

The research method used in this study was a quasi-experimental method. According to Suharsaputra (2012, p.154), "A quasi-experiment is an experiment where not all variables that can affect the dependent variable can be controlled". This method was intended to see the consequences of the intervention, where this study aimed to determine the effect of using problem-based learning learning methods on students' critical thinking skills with emotional intelligence as a moderating variable in XI IPS class students of SMA Al Islam Boarding School Kondangsari Village, Beber District, Cirebon Regency.

The experimental design used in this study was a factorial design. According to Noor (2014, p.62) that: "Factorial design is an action on one or more variables that are manipulated simultaneously in order to study the effect of each variable on the dependent variable or the effect caused by the interaction between several variables". The factorial design used in this study was 2 x 3 where the learning method consisted of two method, namely problem-based learning method and lecture learning method, while students' emotional intelligence consists of three levels, namely high emotional intelligence, medium emotional intelligence, and low emotional intelligence. Thus, the factorial design in this study can be explained further in table 2 as follows:

Table 2. *Research design*

Emotional Intelligence (B)	Learning Methods (A)	
	PBL (A_1)	Lecture (A_2)
High (B_1)	A_1B_1	A_2B_1
Medium (B_2)	A_1B_2	A_2B_2
Low (B_3)	A_1B_3	A_2B_3

Description:
A   : Learning method
A1   : Problem-based learning method
A2   : Lecture learning method
B   : Emotional intelligence
B1   : High emotional intelligence
B2   : Medium emotional intelligence
B3   : Low emotional intelligence

Operational variable
Research variable
The variables of this study consisted of three types, namely the dependent variable, the independent variable, and the moderating variable as described in the following description: (1) The dependent variable: the students' critical thinking ability. (2) The independent variable: the problem-based learning method. (3) The moderating variable: emotional intelligence.

Table 3. *Operational variable*

Variable	Variable Definition	Variable Indicator	Instrument
Critical Thinking Skill	The ability of individuals to use their thought processes to analyze arguments and provide interpretations based on correct and rational perceptions, analysis of assumptions and biases of arguments, and logical interpretations (Hamalik, 2013, p.72)	1. Give a simple explanation 2. Build basic skills 3. Make a conclusion 4. Provide further explanation 5. Set strategy and tactics (Ennis in Sianturi, 2018)	Test
Emotional Intelligence	A person's ability to regulate his emotional life with intelligence, maintain emotional harmony and express it through self-awareness, self-control, self-motivation, empathy and social skills. (Goleman, 2015, p.512)	1. Self-awareness 2. Emotional management 3. Productive use of emotions 4. Empathy 5. Relationship building (Goleman, 2015, p.513)	Questionnaire

Research subject

The subjects of this study were 66 students of class XI Social Sciences SMA Al Islam Boarding School Kondangsari Village, Beber District, Cirebon Regency which were divided into three classes, namely class XI IPS 1, XI IPS 2, and XI IPS 3 with 22 students each. The class that was used as the research subject was class XI IPS 2 and class XI IPS 3 while class XI IPS 1 was used as an instrument test class. Class XI IPS 2 was used as the experimental class while class XI IPS 3 was used as the control class.

Technique of collecting data

Data collection techniques in this study were collected from test and questionnaire.

Test. Giving tests in this study aimed to determine the extent to which students' critical thinking skills are.

Questionnaire. The questionnaire in this study was used to collect data related to students' emotional intelligence. The research questionnaire was prepared using the attitude scale of the Likert method. The available alternative answers are: Strongly Agree (SS), Agree (S), Hesitant (RR), Disagree (TS), and Strongly Disagree (STS). Answer scoring scores with a range of 1 – 5 where the lowest score is given to Strongly Disagree (STS) and the highest score is given to Strongly Agree (SS).

Instrument test
Validity test

To determine the validity of the research instrument in the form of description questions, the Pearson product moment correlation formula was used as follows:

$$r_{xy} = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{\{n\sum X^2 - (\sum X)^2\}\{n\sum Y^2 - (\sum Y)^2\}}}$$

Source: Priyatno (2013, p.16)

Description:
r_{xy} : Question validity value
n : Number of samples
X : Score for each question
Y : Total score of each sample
Σ : Quantity

Reliability test

Reliability testing in this study was carried out by using the Alpha Cronbach technique through the following:

$$r_{11} = \left[\frac{k}{k-1}\right]\left[1 - \frac{\sum \sigma_b^2}{\sigma_1^2}\right]$$

Source: Priyatno (2013, p.25)

Description:
r_{11} : Question reliability score
k : Number of questions
$\sum\sigma_b^2$: Number of question variants
σ_1^2 : Total of variance

Difficulty level test

Testing the level of difficulty is to examine the test questions in terms of difficulty so that it can be obtained which questions are easy, medium, and difficult. Reliability testing in this study was carried out with the following calculation formula:

$$P = \frac{X}{Sm.N}$$

Source: Noor (2014, p.175)

Description:
P : Proportion of correct answers or difficulty level
X : Total score of each question
Sm : Maximum score
N : Number of samples

Question difficulty level criteria
Table 4. *Question difficulty level criteria*

Value range	Category
P ≤ 0,30	Difficulte
0,30 < P ≤ 0,70	Medium
P > 0,70	Easy

Source: Noor (2014, p.175)

Discriminatory power test

The discriminatory power test can be found using the following formula:

$$D = \frac{\overline{X}_A - \overline{X}_B}{Sm}$$

Source: Noor (2014, p.176)

Description:
D : Discriminatory index
A : The number of correct answers in the upper group (27%)
B : The number of correct answers in the lower group (27%)
$\overline{X}_A$: The mean of the upper group sample
$\overline{X}_A$: The mean of the lower group sample
Sm : Maximum score of the question

The results of the discriminatory index calculation were then consulted on the discriminatory index criteria table for the test questions as follows:

Table 5. *Criteria for discriminating power of questions*

Value range	Category
D ≤ 0,20	Replaced
0,20 < D ≤ 0,30	Fixed
D > 0,30	Used

Source: Noor (2014, p.176)

Data analysis technique
Normality test
Normality testing was carried out with the aim of knowing whether the research data is normal or not as a condition for using parametric statistics. The normality test in this study was used to determine whether the research data was normal or not. Normality test in this study used the Kolmogorov-Smirnov test. The results of this analysis werre then compared with the critical value. According to Priyatno (2013), the basis for decision making can be based on probability: "If probability > 0.05 then the distribution of the population is normal and if the probability is < 0.05 then the distribution of the population is not normal."

Homogeneity test
This test was carried out with the aim of meeting the requirements for using parametric statistics. The homogeneity test in this study used the Levene test with the test criteria if the significance value is greater than 0.05 then it can be said that the variance of two or more data groups is the same while if the significance value is less than 0.05 then it can be said that the variance of the two groups of data is the same. or more data sets are different.

Hypothesis test
Hypothesis testing in this study used two-way analysis of variance (ANOVA). According to Winarsunu (2006, p.107) that: "Factorial ANOVA or often called multiple ANOVA is a parametric statistical technique used to test differences between groups of data originating from 2 or more independent variables". The two-way ANOVA analysis in this study can be explained as follows:

Table 6. *The two-way ANOVA analysis design*

Source	Sum of Square (SS)	degrees of freedom (df)	Mean Squares (MS)	F
Factor A	$\dfrac{\sum A^2}{(b)(n)} - \dfrac{\sum T^2}{(a)(b)(n)}$	a-1	$\dfrac{SS_A}{df_A}$	$\dfrac{MS_A}{MS_{Error}}$
Factor B	$\dfrac{\sum B^2}{(a)(n)} - \dfrac{\sum T^2}{(a)(b)(n)}$	b-1	$\dfrac{SS_B}{df_B}$	$\dfrac{MS_B}{MS_{Error}}$
A*B Interaction	$\dfrac{\sum AB^2}{n} - \dfrac{\sum A^2}{(b)(n)} - \dfrac{\sum B^2}{(a)(n)} + \dfrac{\sum T^2}{(a)(b)(n)}$	(a-1) (b-1)	$\dfrac{SS_{A*B}}{df_{A*B}}$	$\dfrac{MS_{A*B}}{MS_{Error}}$
Error	$\sum Y^2 - \dfrac{\sum (AB)^2}{n}$	(a) (b) (n-1)	$\dfrac{SS_{Error}}{df_{Error}}$	
Total	$\sum Y^2 - \dfrac{\sum T^2}{(a)(b)(n)}$	(a) (b) (n) - 1		

Source: Kusnendi (2018, p.6)

Table 7. *Statistic hyphothesis*

Statistic Hyphothesis		Test of Statistic	Test Criteria
Ho : α$_A$	= 0 : There is no A influence towards Y	F_A	Ho is declined if : F_A > F table for α, df$_{effect}$ and certain df$_{error}$, or $p \leq 0,05$
H$_A$: α$_A$	≠ 0 : There is A influence towards Y		
Ho : α$_B$	= 0 : There is no B influence towards Y	F_B	Ho is declined if : F_B > F table for α, df$_{effect}$ and certain df$_{error}$, or $p \leq 0,05$
H$_A$: α$_B$	≠ 0 : There is B influence towards Y		
Ho : α$_{A*B}$	= 0 : There is no influence of interaction between A and B towards Y	F_{A*B}	Ho is declined if : F_{A*B} > F table for α, df$_{effect}$ and certain df$_{error}$, or $p \leq 0,05$
H$_A$: α$_{A*B}$	≠ 0 : There is influence of interaction between A and B towards Y		

Source: Kusnendi (2018, p.6)

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To find out the magnitude of the influence of each research variable, Eta formula was used as described in the following description:

Eta square (n^2)

Factor influence:
$$A: n_A^2 = \frac{SS_A}{SS_{Total}}$$

Factor influence:
$$B: n_B^2 = \frac{SS_B}{SS_{Total}}$$

Interaction influence:
$$A*B: n_{A*B}^2 = \frac{SS_{A*B}}{SS_{Total}}$$

Partian eta square (Pn^2)

Factor influence:
$$A: Pn_A^2 = \frac{SS_A}{SS_A + SS_{Error}}$$

Factor influence:
$$B: Pn_B^2 = \frac{SS_B}{SS_B + SS_{Error}}$$

Interaction influence:
$$A*B: Pn_{A*B}^2 = \frac{SS_{A*B}}{SS_{A*B} + SS_{Error}}$$

(Kusnendi, 2018, pp. 6-7)

RESULTS AND DISCUSSION

Description of students' emotional intelligence

Descriptive analysis is a data analysis technique that aims to describe the existing situation or event. This analysis aimed to describe the emotional intelligence of students both in the experimental class and in the control class. Each statement item has a score range of 1 to 5 for both positive and negative statements so that the highest average value is 5 and the lowest average value is 1 so that the criteria for the average respondents' responses are:

Table 8. *Average responses of research respondentsan*

No.	Criteria	Mean
1	Very low	1,00 – 1,79
2	Low	1,80 – 2,59
3	Medium	2,60 – 3,39
4	High	3,40 – 4,19
5	Very high	4,20 – 5,00

Source: Muhidin & Abdurahman (2011, p.146)

Based on the category of students' emotional intelligence, it can be determined descriptively of the emotional intelligence of experimental class students based on respondents' responses to each statement item and the following total scores:

Table 9. *Recapitulation of respondents' responses to the emotional intelligence of experiment class students*

No.	Statement	Score	Mean
1	I know my own feelings such as happiness, anger, disappointment, shame, and others.	87	3,95
2	I understand the causes of feelings that arise	85	3,86
3	I do not know the influence of feeling towards an action.	84	3,82
4	I can control my anger well.	74	3,36
5	I cannot express my anger properly (fighting easily).	77	3,50
6	I can control unfavorable behavior (vengeance, anger, and irritability) which harm myself and others.	74	3,36
7	I have good feelings of myself, school, and family.	75	3,41
8	I have the ability to overcome learning difficulty.	78	3,55
9	I can reduce feelings of loneliness and anxiety in relationship	81	3,68
10	I have a sense of responsibility toward learning.	78	3,55
11	I am not able to focus on the schoolwork.	78	3,55
12	I am able to control myself and do not change my mind easily.	82	3,73
13	I am able to accept the opinions of my friends.	79	3,59
14	I do not have a caring attitude towards the feelings of others.	82	3,73
15	I am able to listen to the teacher's advice.	79	3,59
16	I am able to feel the benefits of hanging out with my friends.	78	3,55
17	I can solve problems with my friends.	78	3,55
18	I have the ability to communicate with others.	75	3,41
19	I have a friendly attitude or get along easily with my peers.	76	3,45
20	I do not have an attitude of tolerance and concern for others.	79	3,59
21	I like to help others.	77	3,50
22	I am happy to share happiness with my friends.	80	3,64
23	I don't discriminate between friends insocializing.	80	3,64
	Total	1816	3,59

Based on table 9, it can be seen that respondents' responses to the emotional intelligence of experiment class students reached a total score of 1816 with an average of 3.59. If it is interpreted on the average responses of research respondents, the average is included in the high category (3.40 – 4.19). This shows that the emotional intelligence of experiment class students was generally perceived as high. Thus, the emotional intelligence criteria area of experiment class students can be explained in the following figure:
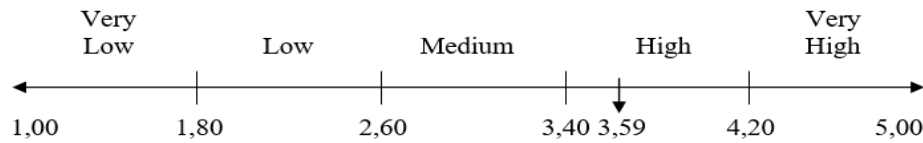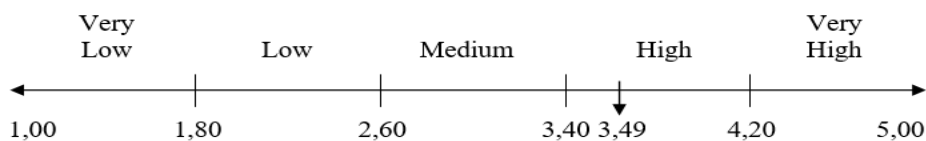

Figure 1. *Criteria for emotional intelligence of experimental class students*

The thing that makes the emotional intelligence of experimental class students highly rated by respondents can be seen in item 1 which states that students know their own feelings such as happiness, anger, disappointment, shame, and others; and item 2 which states that students understand the causes of feelings that arise. Things that make the emotional intelligence of experiment class students less than optimal or perceived low by respondents can be seen in item 6 which states that students are quite able to control unfavorable behavior (vengeance, anger, and irritability) that harm themselves and others and item 4 states that students are able to control anger well.

Furthermore, the emotional intelligence of experimental class students was re-categorized with the provisions of high (3.40 – 5.00), medium (2.60 – 3.39), and low (1.00 – 2.59) (Muhidin and Abdurahman, 2011). It aimed to simplify the data categories in the two-way ANOVA test. Based on the category of students' emotional intelligence, it can be determined the frequency distribution of the experiment class students' emotional intelligence. The results of the descriptive analysis using the SPSS application program obtained the following outputs:

Table 10. *Description of experiment class students' emotional intelligence*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	15	68.2	68.2	68.2
	Medium	6	27.3	27.3	95.5
	Low	1	4.5	4.5	100.0
	Total	**22**	**100.0**	**100.0**	

Based on the table above, it can be seen that in the experimental class there were 15 students (68.2%) with high emotional intelligence; 6 students (27.3%) with moderate emotional intelligence, and 1 student (4.5%) with low emotional intelligence. Thus, the majority of experiment class students have high emotional intelligence. These results can be explained again in the following graph:
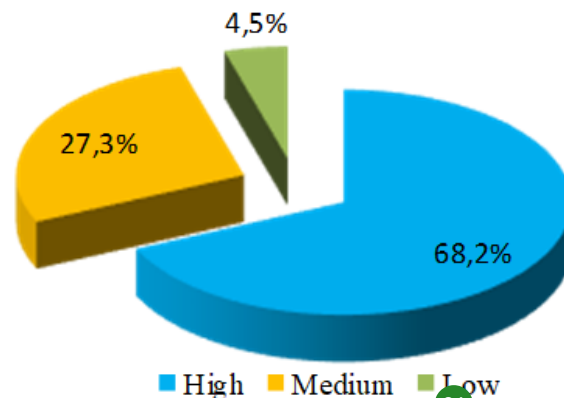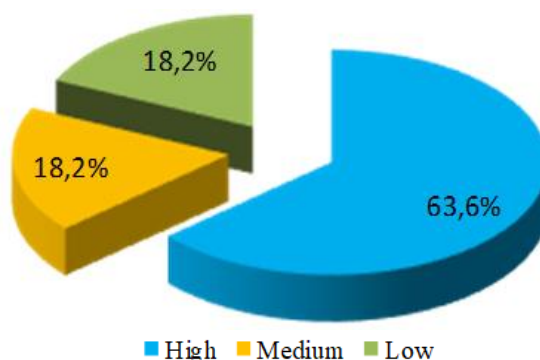

Figure 2. *Description of experiment class students' emotional intelligence*

Based on the category of emotional intelligence of students in table 11, it can be determined descriptively of emotional intelligence of control class students based on respondents' responses to each statement item and the following total scores:

Table 11. *Recapitulation of respondents' responses to the emotional intelligence of control class students*

No.	Statement	Score	Mean
1	I know my own feelings such as happiness, anger, disappointment, shame, and others.	86	3,91
2	I understand the causes of feelings that arise	84	3,82
3	I do not know the influence of feeling towards an action.	81	3,68
4	I can control my anger well.	68	3,09
5	I cannot express my anger properly (fighting easily).	75	3,41
6	I can control unfavorable behavior (vengeance, anger, and irritability) which harm myself and others.	69	3,14
7	I have good feelings of myself, school, and family.	75	3,41
8	I have the ability to overcome learning difficulty.	71	3,23
9	I can reduce feelings of loneliness and anxiety in relationship	74	3,36
10	I have a sense of responsibility toward learning.	73	3,32
11	I am not able to focus on the schoolwork.	78	3,55
12	I am able to control myself and do not change my mind easily.	75	3,41
13	I am able to accept the opinions of my friends.	81	3,68
14	I do not have a caring attitude towards the feelings of others.	80	3,64
15	I am able to listen to the teacher's advice.	81	3,68
16	I am able to feel the benefits of hanging out with my friends.	77	3,50
17	I can solve problems with my friends.	77	3,50
18	I have the ability to communicate with others.	80	3,64
19	I have a friendly attitude or get along easily with my peers.	76	3,45
20	I do not have an attitude of tolerance and concern for others.	77	3,50
21	I like to help others.	76	3,45
22	I am happy to share happiness with my friends.	76	3,45
23	I don't discriminate between friends insocializing.	77	3,50
	Total	**1767**	**3,49**

Based on table 11, it can be seen that respondents' responses to the emotional intelligence of control class students reached a total score of 1767 with an average of 3.49. If it is interpreted on the average responses of research respondents, the average is included in the high category (3.40 – 4.19). This shows that the emotional intelligence of the control class students is generally perceived as high by the respondents. Thus, the emotional intelligence criteria area of control class students can be explained in the following figure:

Figure 3. *Criteria for emotional intelligence of control class students*

The thing that makes the emotional intelligence of control class students highly rated by respondents can be seen in item 1 which states that students know their own feelings such as happiness, anger, disappointment, shame, and others; and item 2 which states that students understand the causes of feelings that arise. Things that make the emotional intelligence of control class students less than optimal or perceived low by respondents can be seen in item 4 which states students are quite able to control anger well and item 6 which states students are quite able to control bad behavior (revenge, anger, and irritability) that harms self and others.

Furthermore, the emotional intelligence of control class students was re-categorized with the provisions of high (3.40 – 5.00), moderate (2.60 – 3.39), and low (1.00 – 2.59) (Muhidin and Abdurahman, 2011). It aims to simplify the data categories in the two-way ANOVA test. Based on the

category of students' emotional intelligence, it can be determined the distribution of the emotional intelligence frequency of control class students. The results of the descriptive analysis using the SPSS application program obtained the following outputs:

Tabel 12. *Description of control class students' emotional intelligence*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	14	63.6	63.6	63.6
	Medium	4	18.2	18.2	81.8
	Low	4	18.2	18.2	100.0
	Total	22	100.0	100.0	

Based on the table above, it can be seen that in the control class there were 14 students (63.6%) with high emotional intelligence; 4 students (18.2%) with moderate emotional intelligence, and 2 students

(18.2%) with low emotional intelligence. Thus, the majority control class students have high emotional intelligence. These results can be explained again in the following graph:

Figure 4. *Description of control class students' emotional intelligence*

Based on the description of the descriptive analysis, it can be seen that the respondents' responses to the emotional intelligence of the experiment class students reached an average of 3.59 including in the high category and similarly, the respondents' responses to the emotional intelligence of the control class students reached an average of 3.49 including in the high category. Furthermore, the frequency distribution shows that the majority of experiment class students have high emotional intelligence of 68.2% and similarly, the majority control class students have high emotional intelligence of 63.6%. This indicates that there is no difference in the level of emotional intelligence of students between the experiment class using the problem-based learning method and the control class using the lecture learning method.

Description of students' critical thinking skills
Descriptive analysis in this study is also used to describe students' critical thinking skills for both the experimental class and the control class based on the results of pre-test, post-test, and gain. Students' critical thinking ability was measured using test questions in the form of descriptions based on indicators: elementary clarification (giving simple explanations), basic support (building basic skills), inference (making conclusions), advance clarification (giving further explanations), and strategy and tactics (set strategy and tactics). The test results were then given an assessment based on the rubric that has been set by the researcher. The data on students' critical thinking skills were then analyzed using descriptive statistics through the SPSS application program so that the following outputs were obtained:

Table 13. *Description of experimental class students' critical thinking skill*

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test experiment critical thinking skill	22	29	67	47.68	13.667
Post-test experiment critical thinking skill	22	51	89	71.64	12.591
Gain experiment critical thinking skill	22	20	29	23.95	2.716
Valid N (listwise)	22				

From the table above, it can be seen that the critical thinking ability of the experimental class students based on the pre-test has an average of 47.68 with a minimum value of 29, a maximum value of 67, and a standard deviation of 13.667. After being given an intervention in the form of a problem-based learning method, the critical thinking skills of the experimental class students increased so that they were able to reach an average of 71.64 with a minimum score of 51, a maximum value of 89, and a standard deviation of 12,591. The increase in critical thinking skills of the experimental class students was indicated by the gain which reached an average of 23.95 with a minimum value of 20, a maximum value of 29, and a standard deviation of 2.716. These results can be explained visually as a graph or diagram as follows:
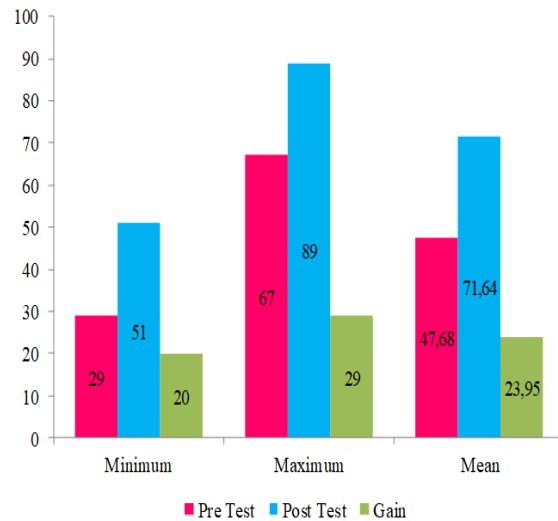
Figure 5. *Description of experiment class students' critical thinking skill*

Table 14. *Description of control class students' critical thinking skill*

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test experiment critical thinking skill	22	28	66	47.55	12.137
Post-test experiment critical thinking skill	22	44	80	62.91	11.380
Gain experiment critical thinking skill	22	12	21	15.36	2.421
Valid N (listwise)	22				

From the table above, it can be seen that the critical thinking ability of the control class students based on the pre-test has an average of 47.55 with a minimum score of 28, a maximum value of 66, and a standard deviation of 12.137. After being given an intervention in the form of lecture or conventional learning methods, the critical thinking skills of control class students increased so that they were able to reach an average of 62.91 with a minimum score of 44, a maximum value of 80, and a standard deviation of 11.380. The improvement in critical thinking skills of the control class students was indicated by the gain which reached an average of 15.36 with a minimum score of 12, a maximum value of 21, and a standard deviation of 2,421. These results can be further explained visually as a graph as follows:
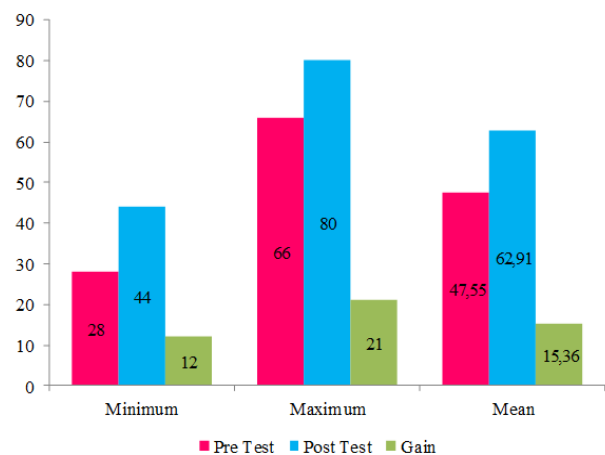
Figure 6. *Description of control class students' critical thinking skill*

From the description of the descriptive analysis, it can be seen that based on the pre-test, the critical thinking abilities of the experimental class and

control class students are declared the same because they have an average that is not much different, respectively 47.68 and 47.55. However, after being given different interventions where the experimental class used problem-based learning and the control class used the lecture learning method, there were differences in the critical thinking abilities of the experimental class and control class students, each of which reached an average of 71.64 and 62.91. This is indicated by the average gain of the experimental class which reached 23.95 while the average gain of the control class only reached 15.36. Thus, the critical thinking ability of the experimental class students who used the problem-based learning method was better or higher than the control class students' critical thinking skills using the lecture learning method.

Hypothesis testing in this study uses two-way analysis of variance (ANOVA). Factorial ANOVA or often called multiple ANOVA is a parametric statistical technique used to examine differences between groups of data derived from two or more independent variables. Factorial ANOVA has several advantages including researchers can see the effect of various independent variables on the dependent variable either separately (independently) or combined (interaction). Two-way ANOVA analysis using the SPSS application program obtained the results in the following table:

Table 15. *Hyphothesis testing of Anova two ways*

No.	Hyphothesis testing	F_{count}	*Sig.*	*Partial Eta Squared*
1	The effect of using *problem-based learning* method on critical thinking skill	83,745	0,000	0,688
2	The effect of emotional intelligence on critical thinking skill	5,954	0,006	0,239
3	The effect of interaction between using *problem-based learning* method and emotional intelligence towards critical thinking skill	3,658	0,035	0,161

Based on the table above, it can be tested hypotheses for the effect of using problem-based learning learning methods on students' critical thinking skills with emotional intelligence as a moderating variable as explained further in the following description:

Hypothesis testing 1. Based on table 15 it can be seen that the learning method variable (MP) has a *partial eta squared value* of 0.688 indicating that the effect of using problem-based learning learning methods on critical thinking skills is 68.8%. Furthermore, the learning method variable (MP) has an F_{count} of 83,745 with a significance of 0.000. The value of F_{table} can be obtained in F_{table} with a significance level of 0.05 with df1 = a – 1 = 2 – 1 = 1 and df2 = n – (axb) = 44 – (2 x 3) = 44 – 6 = 38, which is 4.098172. The value of F_{count} = 83,745 > F_{table} = 4.098172 and significance = 0.000 <0.05 then H_o is rejected and H_a is accepted, meaning that there is a significant effect of using problem-based learning learning methods on critical thinking skills. Thus, hypothesis 1 proposed in this study can be proven true so that it can be used as a conclusion.

Hypothesis testing 2. Based on table 15, it can be seen that the emotional intelligence (KE) variable has a *partial eta squared value* of 0.239 indicating that the influence of emotional intelligence on critical thinking skills is 23.9%. Furthermore, emotional intelligence (KE) has an F_{count} of 5.954 with a significance of 0.006. The value of F_{table} can be obtained in F_{table} with a significance level of 0.05 with df1 = b – 1 = 3 – 1 = 2 and df2 = n – (axb) = 44 – (2 x 3) = 44 – 6 = 38 which is 3.244818. The value of F_{count} = 5.954 > F_{table} = 3.244818, and significance = 0.006 <0.05, then H_o is rejected and H_a is accepted, meaning that there is a significant influence of emotional intelligence on critical thinking skills. Thus, hypothesis 2 proposed in this study can be proven true so that it can be used as a conclusion.

Testing Hypothesis 3. Based on table 15, it can be seen that the interaction variable between learning methods and emotional intelligence (MP*KE) has a *partial eta squared value* of 0.161 indicating that the interaction effect between the use of problem-based learning and emotional intelligence on critical thinking skills is 16,1%. Furthermore, the interaction variable between learning methods and emotional intelligence (MP*KE) has an F_{count} of 3.658 with a significance of 0.035. The value of F_{table} can be obtained in Table F_{table} with a significance level of

0.05 with df1 = (a – 1) x (b – 1) = (2 – 1) x (3 – 1) = 1 x 2 = 2 and df2 = n – (axb) = 44 – (2 x 3) = 44 – 6 = 38 which is 3.244818. F_{count} = 3.658 > F_{table} = 3.244818 and significance = 0.035 < 0.05 then H_o is rejected and H_a is accepted, meaning that there is a significant interaction effect between the use of problem-based learning and emotional intelligence on critical thinking skills. These results indicate that emotional intelligence moderates the effect of using problem-based learning methods on critical thinking skills. Thus, hypothesis 3 can be proven true so that it becomes a conclusion.

Furthermore, to find out whether or not there were significant differences between groups, a *Post Hoc* test was used where the test criteria used were if the significance value was <0.05 or there was an asterisk (*) in the mean difference, there was a significant difference between groups. *Post Hoc* test using the SPSS application program obtained the following results:

Table 16. *Turkey HSD Post Hoc Test.*

No.	Group difference test	Mean Difference	Significance value
1	High – medium emotional intelligence	-0,59	0,743
2	High – low emotional intelligence	-0,99	0,619
3	Medium – low emotional intelligence	-0,40	0,939

Based on the table, it is possible to test the differences between groups of emotional intelligence, namely: 1) the difference between the high and medium emotional intelligence groups has a significance = 0.743 > 0.05, so there is no difference between the high emotional intelligence and moderate emotional intelligence groups; 2) the difference between high and low emotional intelligence groups has a significance = 0.619 > 0.05, so there is no difference between groups of high emotional intelligence and low emotional intelligence; and the difference between the medium and low emotional intelligence groups has a significance = 0.939 > 0.05, so there is no difference between the moderate and low emotional intelligence groups. Thus, it can be stated that there is no difference between high, medium, and low emotional intelligence groups.

CONCLUSION

Based on the results of research and discussion that have been described in the previous chapter, some conclusions can be drawn as follows:

There is a significant effect of the use of problem-based learning on the critical thinking skills of students in XI IPS class of SMA Al Islam Boarding School, Kondangsari Village, Beber District, Cirebon Regency.

There is a significant influence of emotional intelligence on the critical thinking ability of students of XI IPS class of SMA Al Islam Boarding School Kondangsari Village, Beber District, Cirebon Regency.

There is a significant interaction effect between the use of problem-based learning and emotional intelligence on the critical thinking skills of XI IPS class students at SMA Al Islam Boarding School, Kondangsari Village, Beber District, Cirebon Regency. The results show that emotional intelligence moderates the effect of using problem-based learning on critical thinking skills.

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