The effects of active learning model guided note taking on student’s critical thinking ability in high school

I M Astra\(^*\), E Budi, and C Evita

Prodi Pendidikan Fisika, FMIPA, Universitas Negeri Jakarta, Jl. Rawamangun Muka No 1 RT 11 RW 14, Pulo Gadung, Kota Jakarta Timur 13220, Indonesia

\(^*\)Corresponding author: imadeastra@gmail.com

Abstract. This study aim to know the effect of active learning model Guided Note Taking (GNT) on student’s critical thinking ability for work and energy subject in senior high school. This study was held in Senior High School 77 on March 2019. This research used a quasi experimental method with a nonrandomized pretest-posttest design. The sample used purposive sampling, so the experimental class and control class were obtained. This research instrument was posttest essay’s type with 10 questions. Based on hypothesis test by t-test with \(\alpha=0.05\) and \(d_{k}=n_{1}+n_{2}-2\), got that \(t_{\text{count}}<t_{\text{table}}\). So, \(H_{0}\) is rejected and \(H_{1}\) is accepted. Then, the conclusion is student’s critical thinking ability who learn with Guided Note Taking model higher than direct instruction model and also Guided Note Taking has an effect on student’s critical thinking ability.

1. Introduction
Humans and education are inseparable things. The more advanced science and technology, humans must be prepared for the development that exists. Through education, it can produce quality human resources so every human need will be fulfilled and humans are ready to encounter scientific developments in the future. Education, in general, is a process to influence the students to be able to adjust with their environment as well as possible, and it will change themselves to be good enough in the people’s lives [1]. Education must be accordance with the current curriculum which is 2013 curriculum or also known K13 [2].

K13 requires students to be more active than teachers in the learning process. With active learning, students are invited to participate in all learning processes, not only their mentally but also physically. In this way, students will be more enjoyable and happier for learning physics so it will improve their knowledge through their critical thinking. One of the problems that occur in education, especially in physics lessons is the weakness of the learning process. Students are not encouraged to discover the knowledge themselves but students are required to remember what teachers have given them. As a result, students are unable to provide solutions to problems that arise especially if the problem is related to the concept of physics. For students themselves physics lesson is an unpleasant lesson because it is full of formulas and must be memorized, resulting in many students who get low learning results or low in critical thinking. Critical thinking is seeing both sides of an issue, being open to new evidence that disconfirms your ideas, reasoning dispassionately, demanding that claims be backed by evidence, deducing and inferring conclusions from available facts, and solving problems [3,4]. By thinking critically, someone can produce more accurate and relevant knowledge where obtained from observations, experiences, common sense or communication. Critical thinking requires interpretation.
and evaluation of observation, communication and other sources of information. Ennis [5] states that there are 12 indicators of critical thinking ability. This research uses 7 indicators are: 1) Analyzing arguments, 2) Ask and answer questions, 3) Assess the credibility of sources of information, 4) Observe and assess reports on the results of observation, 5) Make decisions, 6) Identifying assumptions, and 7) Determine actions.

One way to improve student's critical thinking ability in physics learning especially work and energy problems is active learning model Guided Note Taking (GNT) type or the provision of guided notes. Guided Note Taking (GNT) learning model is one of the learning models that can answer the educational needs in accordance with the 2013 curriculum. Guided Note Taking (GNT) or the provision of guided notes is an active learning model chosen to help the teacher to deliver a lesson in the class using handout as a teaching material by removing some parts which are the important points of physics lesson where is delivered by lecture method [6].

Guided notes are using handouts prepared by the teacher that are used to help students while writing student’s notes so it can reduce student’s activities require the cognitive so learning can be delivered well [7]. The steps of Guided Note Taking (GNT) learning model are: 1) Observe, 2) Questions, 3) Try, 4) Associate, and 5) Communicate [6]. The benefits of Guided Note Taking (GNT) learning model are: 1) This learning model is simple to use. Teacher gives students a handout that contains learning material and remove some important points in the handout, so students can fill out the empties part of handout during the learning process, 2) This learning model is suitable to replace narrative summaries or long narrative summaries, 3) By using handouts, this learning model could help students to prepare themselves when they have an exam or test [8].

Other studies have demonstrated the positive impact of guided note-taking learning model implementation that the results of the research by [9] conclude that After studying climate change materials using learning guide note-taking, there is an increase of learning outcomes, so guide note-taking model is more effective in improving students' learning outcomes.

Based on the background above, it was proposed to conduct a study on "The Effects of Active Learning Model Guided Note Taking (GNT) on Student’s Critical Thinking Ability in High School ". By conducting this research, expected that students can think critically by Guided Note Taking (GNT) model to get maximum learning outcomes in physics lesson about work and energy at school.

2. Methods
The research used quasi experimental method with Nonrandomized Pretest-Posttest Design because the experiment doing in the selected classroom and will know the effects of Guided Note Taking learning model.

The sample used purposive sampling, so the experimental class and control class were obtained. The research was held in Senior High School 77 on March 2019. X MIPA 1 as a experimental class applied Guided Note Taking learning model and X MIPA 2 as a control class applied Direct Instruction. Before the research started, a pretest was given to know both classes have the same condition.

The research’s procedure are: 1) preparation phase, survey the places for the research, arrangement of research permissions from the University, and prepare the research instruments which are lattice instruments, plans for implementing learning, handouts, printed books, and all the things that support the implementation of learning in the class that has been prepared with the guidance of a supervisor, 2) Implementation phase, the experimental class and control class given treatment 4 meetings ( 1 meetings is 3x45 minutes). Before the experiment started, both of classes given a pretest about work and energy to know how far the students understand. And then, given a lesson about work and energy with using research instruments which is handout for the experimental class and the control class with direct instruction by the teacher, 3) Final phase, Analyze the data that has been obtained by normality, homogeneity, and hypothesis test, and make the conclusions based on the results obtained from data processing.
Instrument of the research in the learning process are RPP, handout about work and energy physics book, and at the last meeting, gave a posttest essay’s type with 10 questions to know the critical thinking of students in the both of classes. When the data has taked, then analysis the data with the normality test by chi-quadrate. If the data has normal distribution, then count homogeneity test. After that, used hypothesis test by t-test if $t_{\text{count}} > t_{\text{table}}$, so the $H_0$ is rejected and $H_a$ is accepted. Thus, students critical thinking ability who taught by active learning model guided note taking type are higher than student’s critical thinking ability who taught by direct instruction, and active learning model guided note taking type have an effect on student’s critical thinking ability of physics for high school.

3. Result and Discussion

3.1. Data Description in this Research

The data obtained in this research are critical thinking ability from 36 students of experimental class (X MIPA 1) and 36 students of control class (X MIPA 2) in senior high school 77 Jakarta. Before given treatment, both classes were given a pretest to find out the initial abilities of the experiment class and control class. The data can be seen in following table and graphic.

| Statistic          | Control Class (Pretest) | Experimental Class (Pretest) | Control Class (Posttest) | Experimental Class (Posttest) |
|--------------------|-------------------------|-----------------------------|--------------------------|------------------------------|
| n (lots of data)   | 36                      | 36                          | 36                       | 36                           |
| Low Score          | 23                      | 25                          | 52                       | 62                           |
| High Score         | 63                      | 61                          | 86                       | 98                           |
| Range              | 40                      | 36                          | 34                       | 36                           |
| Average            | 42.72                   | 43.25                       | 70.17                    | 79.04                        |

Table 1 shows that the average pretest of experimental class is 43.25 and control class is 42.72. It means both of classes had the same abilities before given a treatment. Besides that, the average of posttest experimental class is 79.04 and control class is 70.17 which is the posttest result of experimental class higher than the control class. In the experimental class, around 24 students who got the posttest score is higher than Standard of minimum completeness score. Then in the control class, around 11 students who got posttest score is higher than Standard of minimum completeness score. This can also prove that active learning model Guided Note Taking has an effect on critical thinking ability of physics for high school, especially for work and energy.

| Class               | Average of Pretest | Average of Posttest | Increase |
|---------------------|--------------------|---------------------|----------|
| Control Class       | 42.72              | 70.17               | 27.45    |
| Experimental Class  | 43.25              | 79.04               | 35.79    |
Based on table 2, we know that from the pretest to the posttest results for the control class is increasing 27.45 and for the experimental class is increasing 35.79. So, it prove that critical thinking ability in the both of classes was increase, but the experimental class have higher critical thinking ability than control class because experimental class have more increasing than control class. It shown on the figure 1.

**Table 3.** Percentage Indicators of Critical Thinking Ability Experimental Class and Control Class

| Indicators of critical thinking ability | Questions number | Experimental class | Control class |
|----------------------------------------|------------------|--------------------|--------------|
| Analyzing arguments                    | 4                | 100                | 93           |
| Ask and answer questions               | 8                | 79                 | 74           |
| Assess the credibility of sources of information | 9 | 73 | 74 |
| Observe and assess reports on the results of observation | 5 | 71 | 56 |
| Make decisions                         | 1                | 95                 | 92           |
|                                        | 3                | 76                 | 72           |
|                                        | 10               | 78                 | 72           |
| Identifying assumptions                | 2                | 81                 | 67           |
| Determine actions                      | 6                | 69                 | 55           |
|                                        | 7                | 68                 | 47           |
Based on table 3, proved that student’s critical thinking ability the experimental class more than control class. While in the class, students focused on the lesson by completed the empties part of handout. Besides that, the students more remember what the lesson talking about, because they listen and write some part of handout. In indicator Assess the credibility of sources of information, control class have more than percentage compared to experimental class, but it’s not significant. Every indicator except indicators determine actions, students reach a good percentage which means students have a good critical thinking. Both of classes got highest percentage in indicators analyzing arguments and the lowest percentage in indicators determine actions because both of classes have a small percentage. It because students not have much practices at home about the lesson work and energy especially kinetic energy of spring so students cannot answer the questions well. So, the active learning model Guided Note Taking has an effect on critical thinking ability of physics for high school, especially for work and energy.

3.2. Normality Test, Homogeneity Test and T-Test for Hypotheses

Table 4 shows the results data of normality test of pretest and table 5 shows the results data of normality test of posttest. Normality test of pretest by using Chi-Square [11] with α = 0.05 and degree of freedom = 35. Because \( X^2_{\text{count}} \leq X^2_{\text{table}} \), so the data of two classes has a normal distribution.

**Table 4. Normality Test of Pretest**

| Class        | \( X^2_{\text{count}} \) | \( X^2_{\text{table}} \) | Status  |
|--------------|---------------------------|---------------------------|---------|
| Experimental | 4.5750                    | 11.0705                   | Normal  |
| Control      | 4.6357                    | 11.0705                   | Normal  |

**Table 5. Normality Test of Posttest**

| Class        | \( X^2_{\text{count}} \) | \( X^2_{\text{table}} \) | Status  |
|--------------|---------------------------|---------------------------|---------|
| Experimental | 4.5783                    | 11.0705                   | Normal  |
| Control      | 4.7247                    | 11.0705                   | Normal  |

Table 6 shows the results data of homogeneity test between pretest and posttest results from experiment class and control class, with α = 0.05 and degree of freedom = 35. Because \( F_{\text{count}} \leq F_{\text{table}} \), so the data is homogeny.

**Table 6. Homogeneity Test**

| Kind of Data | \( F_{\text{count}} \) | \( F_{\text{table}} \) | Status  |
|--------------|-------------------------|-------------------------|---------|
| Pretest      | 1.1628                  | 1.7571                  | Homogeny|
| Posttest     | 1.4269                  | 1.7571                  | Homogeny|

Table 7 shows that the hypotheses test by t-test, with degree of freedom = 35 and α = 0.05. Based on the table 7, the results of hypotheses testing obtained a value of \( t_{\text{count}} > t_{\text{table}} \), so the \( H_0 \) is rejected and \( Ha \) is accepted. Thus, students critical thinking ability who taught by active learning model guided note taking type are higher than student’s critical thinking ability who taught by direct instruction, and active learning model guided note taking type have an effect on student’s critical thinking ability of physics for high school.
Table 7. Hypotheses Test by T-Test

| Part of Statistic       | Experimental Class | Control Class |
|-------------------------|--------------------|---------------|
| Average                 | 79.04              | 70.17         |
| Varians                 | 63.83              | 91.09         |
| Standar Deviation       | 7.99               | 9.54          |
| Much of Students        | 36                 | 36            |
| T<sub>table</sub>        | 1.667              |               |
| T<sub>count</sub>        | 4.2783             |               |

By applying the steps of guided note taking model, students more focused to observe the teacher, can make a question to add their knowledge, can try to solve the problem so the teacher can give a correction to all students, and they can communicate all the students about what students want to learn about work and energy, besides that, by removing some part of handout, it can stimulate the students to understand about work and energy and they can complete the post test’s questions correctly and properly. The results of this research compare with the research “A Guided Note Taking Strategy supports students learning in the large lecture classes” conclude that majority of the students provided positive agreements when responding to the surveys of their perceptions after learning with the guided notes. The guided note strategy yielded positive results in both cognitive and affective facets, this could be a useful instructional approach for lecturers who are facing problems in managing large lecture classes [10]. Another research supported the results of this experiment “A review of the Effectiveness of Guided Notes for Students who Struggle Learning Academic Content “ concluded that guided notes have the potential to increase academic outcomes for many students as they make note taking more manageable by reducing the cognitive demands, ensuring the accuracy of notes, and providing students with the opportunity to focus on the most important information from a lecture [7]. So, by using this model students could think critically in the learning process and it can make students more accurate and have relevant knowledge.

4. Conclusion

Based on the results of the research, concluded that the active learning model guided note taking have an effect on student’s critical thinking ability in high school.

5. References

[1] Hamalik O 2009 Kurikulum dan Pembelajaran Jakarta: Bumi Aksara 3
[2] Naqiyah M, Rosana D, Sukardiyono, and Ernasari 2019 Developing Physics Learning Tools Based on Local Wisdom in the Form of Musical Instrumen of Gandrang Bulo Dance as Learning Source in Sound Wave Journal for the Education of Gifted Young Scientists 7 3 609-626
[3] Willingham D 2003 Critical thinking: Why is it so hard to teach? American Educator 31 8-19
[4] Mahbubah K, Rusdiana D, Juanda E A, Hermita N, Hakim I R, and Samsudin A 2018 Constructing secondary students’ critical thinking skill test on heat concept In International Conference on Mathematics and Science Education of Universitas Pendidikan Indonesia 3 221-226
[5] Ennis Robert 1985 Developing Mind:Goal for a Critical Thinking Curriculum Alexandria, VA: Association for Supervision and Curriculum Development
[6] Silberman M 1996 Active Learning: 101 Strategies to Teach Any Subject London: Allyn and Bacon
[7] Haydon T 2011 A Review of the Effectiveness of Guided Notes for Students who Struggle Learning Academic Content Routledge Taylor Francis Group 55 226-231
[8] Mastropieri M 2003 Promoting success in high school world history: Peer tutoring versus
guided notes Learning Disabilities Research and Practice 18 52-65

[9] Arozaq M 2017 Implementation of Reading Guide Strategy in Global Climate Change Material for Enhancement of Student Learning Outcome International Journal of Active Learning 2 82-89

[10] Tanamatayarat 2017 A Guided Note Taking Strategy supports Students Learning in the Large Lecture Classes Journal of Physics 901 1-6

[11] Sugiyono 2013 Metode Penelitian Pendidikan Kuantitatif, Kualitatif, dan R&D Alfabeta

Acknowledgments
We would like to thank to every linked on this research. Thank you to department of physics State University of Jakarta, Senior High School 77 which have supported the research, and also all of our support systems which cannot mentioned one by one. Hopefully it can be the right method in education especially for the teacher while teach students in the class.