The effects of cooperative learning model think pair share assisted by animation media on learning outcomes of physics in high school

I M Astra*, D Susanti, and S Sakinah
Prodi Pendidikan Fisika, FMIPA, Universitas Negeri Jakarta, Jl. Rawamangun Muka No 1, Pulo Gadung, Kota Jakarta Timur 13220, Indonesia

*Corresponding author: madeastra@gmail.com

Abstract. This study aims to determine the effect of the cooperative learning model Think Pair Share assisted by animation media on learning outcomes of physics in high school. This study was held in SMA Negeri 30 Jakarta. This study used a quasi-experimental method with a nonrandomized pre-test post-test design. The research sample was taken using purposive sampling thus that the experimental class and control class were obtained. The experimental class uses a cooperative learning model Think Pair Share assisted by animation media, while the control class uses direct instruction. The results showed that the learning outcomes of experimental class students were higher than the learning outcomes of control class students. It can be seen from the post-test average value of experimental class = 83,17 and the control class = 78,75. This post-test results were tested using the t-test, resulting t_{count} = 5,429 and t_{table} = 1,667. Based on the results of t-test, the value of t_{count} > t_{table}, means H₀ is rejected and Hₐ is accepted. Then, the conclusion is cooperative learning model Think Pair Share assisted by animation media has an effect on learning outcomes of physics in high school.

1. Introduction
Physics is a series of knowledge to find facts, concepts, principles, theories or laws that are carried out based on scientific steps thus that can produce many products that benefit society for the future [1]. It is all of scientific products that come based on the thinking process.

Basically, learning outcomes obtained by students consists of affective, cognitive and psychomotor domains. But in this study, the control variable was in the form of learning outcomes that led to the cognitive domain, where student’s ability to understand the material taught was measured in this study. The cognitive domain consists of remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C5), and creating (C6) [2,3].

Learning outcomes is one thing that can get by students, after through the learning process, which is to do during real-time [4]. Learning outcomes have a role as indicator for measure the knowledge of students and be priority on evaluation of learning outcomes [5]. In this case, learning outcomes of students were implemented by cooperative learning model think pair share type.

The cooperative learning model can be defined as learning model which linked the group of students in learning process for understanding and learning the subject material. The cooperative learning model has an advantaged role for influence knowledge, social skill and motivation to learn for students [6]. Cooperative learning model is contained by a group of students, which they are study together and increase quality of learning for themselves and their friends [7].
Then about think pair share. Think pair share can make the students think about questions or problems one by one, and then discuss their thought with partner, and sharing their discussion results to forum, example to their other classmates [8]. According to [9] research, think pair share is one type of cooperative learning model that involves students with assignments or several questions and students are given time to think individually. Then in pairs, they individually discuss the findings of each and improve the results of individual thinking. Then after the pair has time to discuss, the class regroups and each pair shares the results of the discussion together in the whole class [9].

In this research, cooperative learning model think pair share type is helped by animation media, in this case is video. According to [10] journal, video is one of media-based time which contain visual elements which combined with other media for representing a content, in this case, is learning material’s content [10].

This study aims to determine the effect of the cooperative learning model Think Pair Share type assisted by animation media on learning outcomes of physics in high school. The problems in learning physics is from teacher and students. From student’s point of view, due to lack of interest in learning physics and less active during the learning show. While from teacher’s point of view, this can occur because the learning media is too ordinary, and the delivery of material by the teacher is less attractive, thus making students feel bored. So that this can affect student learning outcomes, where there are still many students who score below the average.

2. Methods
The research method of this study is quasi-experiment with Nonrandomized Pre-test Post-test Design. This design is selected because the experiment is doing in selected classroom and look at the effects of available classroom. The sampling technique in this research used purposive sampling. Purposive sampling aims to determine the sample intentionally, where the selected class has the same initial ability not based on random, strata and or the same religion. In this case, sampling is not random, but each class is seen based on their respective abilities. The sample in this research is XI MIPA 1 as an experiment class and XI MIPA 2 as a control class. The treatments given both classes include as table 1 here:

| No | Experiment Class | Control Class |
|----|------------------|---------------|
| 1  | Classes are given pre-test sheet to prove how far the knowledge of students in learning physics about wave and sound, before being given with cooperative learning model think pair share type, assisted by animation media. | Classes are given pre-test sheet to prove how far the knowledge of students in learning physics about wave and sound, before being given only with direct instruction. |
| 2  | Classes are given wave and sound material using cooperative learning model think pair share type assisted by animation media | Classes are given wave and sound material using direct instruction |
| 3  | Classes are given post-test sheet to prove whether learning outcomes will be more improved than the results of the previous test, after being taught with cooperative learning model think pair share type, assisted by animation media. | Classes are given post-test sheet to prove whether learning outcomes will be more improved than the results of the previous test, after being taught with direct instruction. |

XI MIPA 1 and XI MIPA 2 will be given pre-test in initial and post-test in final. The pre-test and post-test in two classes use a multiple-choice instrument. These instruments are obtained from validity
test, reliability test, degree of difficulty test and distinguishing features of instrument test. The instrument that has been made consists of C1 until C6 cognitive domain based on Anderson’s taxonomy. There is a table of instrument.

Table 2. The Instrument of the Test

| Indicator                                                                 | C1 | C2 | C3 | C4 | C5 | C6 |
|--------------------------------------------------------------------------|----|----|----|----|----|----|
| Show the basis of the sound waves, the magnitude of sound waves and the characteristic about it. |    |    |    |    | X  |    |
| Identify the relation of velocity of sounds with Modulus Young and Modulus Bulk |    |    |    | X  |    |    |
| Explain the calculation of the string as the source of sound |    |    | X  |    |    |    |
| Interpreting calculations about organa tube as the source of sounds |    | X  |    |    |    |    |
| Apply calculations about the events of the Doppler effect in everyday life. |    |    |    | X  |    |    |
| Operate the observer frequency, source frequency, source velocity and observer velocity in the Doppler effect event. |    |    |    | X  |    |    |
| Compare between a reflect waves and speed in Doppler effect. |    |    |    |    | X  |    |
| Analyze the magnitude of sound flight frequency in a resonance of sounds. |    |    |    | X  |    |    |
| Find the relation between flight sound frequency and resonance |    |    |    |    | X  |    |
| Examine the magnitude of sound intensity and level of sound intensity |    |    |    |    | X  |    |
| Rate the ratio between sound intensity and level of sound intensity |    |    |    |    |    | X  |
| Measuring the level of sound intensity that relate the number of sound source, the distance from the sound source and frequency |    |    |    |    |    | X  |
| Projecting the intensity of the level of sound intensity in the form of problems in real life |    |    |    |    |    | X  |

3. Result and Discussion

3.1 Data Description in this Research

The data obtained in this study are learning outcomes from 36 students of experiment class (XI MIPA 1) and 36 students of control class (XI MIPA 2) in SMA Negeri 30 Jakarta. Before being given treatment, both classes were given a pre-test to find out the initial abilities of the experiment class and control class. The data can be seen in following table and graphic.
Table 3. Descriptive Statistical of Pre-test Results of Experiment Class and Control Class

| Statistic    | Experiment Class | Control Class |
|--------------|------------------|---------------|
| n (lots of data) | 36               | 36            |
| High Score   | 53               | 53            |
| Low Score    | 23               | 23            |
| Range        | 30               | 30            |
| Average      | 38.69            | 36.84         |

Figure 1. Pre-test Results of Experiment Class and Control Class

Table 4. Descriptive Statistical of Post-test Results of Experiment Class and Control Class

| Statistic    | Experiment Class | Control Class |
|--------------|------------------|---------------|
| n (lots of data) | 36               | 36            |
| High Score   | 90               | 87            |
| Low Score    | 73               | 70            |
| Range        | 17               | 17            |
| Average      | 83.17            | 78.75         |
Figure 2. Post-test Results of Experiment Class

Figure 3. Post-test Results of Control Class

Table 3 and table 4 show the pre-test results of experiment class pre-test had an average of 38.69. After being given the treatment by cooperative learning model think pair share type, assisted by animation media, the average post-test of experiment class post-test was 83.17. As for the control class, the average of pre-test was 36.84. After being given the treatment by direct instruction, the average post-test of control class was 78.75. And then based on the graphs (figure 1, 2, and 3), in the experiment class, around 27 students who got the post-test score is higher than average score. Then in the control class, around 21 students who got post-test score is higher than average score. This can also prove that cooperative learning model think pair share type assisted by animation media has an effect on the learning outcomes of physics for high school, especially for wave and sound materials.

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

Normality test of pre-test had counted by Chi-Square with \( \alpha = 0.05 \) and degree of freedom = 35. In experiment class has \( X^2 \) count is 9.759 and control class has \( X^2 \) count is 2.00839 and have \( X^2 \) table fot both of class is 11.070. Because \( X^2_{\text{count}} \leq X^2_{\text{table}} \) in the both of class, so that the data of two classes has a normal distribution. Then normality test of post-test had counted by Chi-Square with \( \alpha = 0.05 \) and degree of freedom = 35. In experiment class has \( X^2 \) count 2.3499 and control class has \( X^2 \) count is 4.9955 and have \( X^2 \) table fot both of class is 11.070. Because \( X^2_{\text{count}} \leq X^2_{\text{table}} \) in the both of class, so that the data of two classes has a normal distribution.
The results data of homogeneity test between pre-test and post-test score from experiment class and control class are 1,316 and 1,07, with α = 0.05 and degree of freedom = 35. Because $F_{\text{count}} \leq F_{\text{table}}$, so that the data is homogeneity. The hypotheses test by t-test, with α = 0.05 and degree of freedom = 35, have results of hypotheses testing obtained a value of $t_{\text{count}} (5.429) > t_{\text{table}} (1.667)$, so the $H_0$ is rejected and $H_a$ is accepted. Thus, learning outcomes of students who taught by cooperative learning model think pair share type, assisted by animation media are higher than learning outcomes of students who taught by direct instruction, and cooperative learning model think pair share type assisted by animation media have an effects on learning outcomes of physics for high school students.

Cooperative learning model think pair share type assisted by animation media can encourage students to be actively involved in learning process, by applying their knowledge, solving problems, discussing with each other, having the courage to convey ideas and having a sense of responsibility towards the task which has been given. Then with the addition of digital animation media that discuss about the subject matter of learning at certain meetings, it can stimulate students to understand the wave and sound material, so that they can apply to the post-test question properly and correctly. This statement was supported by Sunita M. Dol’s journal which the title is TPS (Think Pair Share): An Active learning Strategy to Teach Theory of Computation Course, which the results of this research is have different score between pre-test and post-test, in the experiment and control class. Then, the experiment class score is higher than control class. About animation media is supported by Lirong Xiao’s journal which the title is Animation Trends in Education. Animation media can stimulate the students for enjoying and exciting them to the learning process in the classroom.

4. Conclusion
Cooperative learning model think pair share type assisted by animation media have an effect for learning outcomes of physics in high school. Therefore, cooperative learning model think pair share type assisted by animation media can be used in physics learning in high school for increase the learning outcomes.

5. References
[1] Amin M 2019 Kepemimpinan dalam Islam. *Journal Sosial Politik* 22 121-127
[2] Anderson L 2001 A Taxonomy for Learning, Teaching and Assessing (A Revision of Bloom’s Taxonomy of Educational Objectives). *David McKay Company*
[3] Sumarni S, Ramadhanri R, Sazaki Y, Astika R T, Andika W D, and Prasetyo A E 2019 Development of Child Friendly ICT Textbooks to Improve Professional Competence of Teacher Candidates: A Case Study of Early Childhood Education Program Students. *Journal for the Education of Gifted Young Scientists* 7 3 643-658
[4] Maher A 2004 Proc. Learning Outcomes in Higher Education: Implications for Curriculum Design and Student Learning. *Journal of Hospitality, Leisure, Sport and Tourism Education* 3 47
[5] Hung Lin M 2017 A Study of The Effects of Digital Learning on Learning Motivation and Learning Outcome. *Eurasia Journal of Mathematics Science and Technology Education* 7 3 556
[6] Gillies R M 2003 Co-operative Learning: The Social and Intellectual Outcomes of Learning in Groups. *Routledge Falmer London* 41 40
[7] Fui Fong HO 2007 Cooperative Learning: Exploring its Effectiveness in the Physics Classroom. *Asia-Pacific Forum on Science Learning and Teaching* 8 3
[8] Cheryl L 2018 Utilising the Think-Pair-Share Technique in the Learning of Probability. *International Journal on Emerging Mathematics Education* 2 50
[9] Ariana S 2013 Finding the Effects of Think Pair Share on Student Confidence and Participation. *Honors Projects* 28 10
[10] Yuen M C 2018 Online Video for Self-Directed Learning in Digital Animation. *The Turkish Online Journal of Educational Technology* 17 91
Acknowledgments
Big thanks to all side linked by my research and study, who had help me for writing this paper. Especially for the family of Pendidikan Fisika UNJ and SMA Negeri 30 Jakarta. Hopefully, this paper can be better than before, and of course can be a good reference for future.