META ANALYSIS OF THE EFFECT OF STUDENT WORKSHEET USE ON STUDENT LEARNING OUTCOMES

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ABSTRACT

This research is a meta-analysis of the effect of Student Worksheets on student learning outcomes. The real conditions found in the field of physics student learning outcomes are still low. To improve student learning outcomes, teaching materials are needed that can attract students' interest in learning, one of which is Student Worksheets. This study aims to analyze the effect of Student Worksheets on student learning outcomes. The research method used in this research is meta-analysis research. By collecting and summarizing several articles. Where the sample used consists of 30 articles that have been published in various national and international journals. The selected articles are articles that can be processed to calculate the effect size on the use of Student Worksheets which are then grouped into four indicators, namely based on education level, grade level, learning model and research area. First, the use of Student Worksheets has a significant effect on indicators for junior high school education with a summary effect size of 1,041 in the high category. Second, the use of Student Worksheets has a significant impact in class VIII with a summary effect size of 1,205 which is categorized as very high. Third, the use of worksheets has a significant effect on the Contextual Teaching and Learning (CTL) model with a summary effect size of 1,133 which is categorized as very high. Fourth, the use of Student Worksheets has a significant impact on Bengkulu Province with a summary effect size of 2,124 which is categorized as very high.

Keywords : *Meta-analysis; student worksheets; student learning outcomes.*

I. INTRODUCTION

Education is one of the efforts made to educate the nation's life and improve the quality of human resources. In accordance with Law Number 20 of 2003 concerning the National Education System which states that national education aims to develop the potential of students to become human beings who believe and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become a democratic and responsible citizen.

Entering the 21st century today, education in Indonesia is faced with a number of challenges and opportunities that are certainly different from the previous era. Greater efforts are needed to address these challenges. Learning will not mean much if it does not have an impact on students' lives outside of school. The learning process should be able to direct students to find values, meanings and beliefs about what they have learned and can apply them in real life so that learning becomes more meaningful.

One of the sciences that has an important position to answer challenges in 21st century education is Physics. Physics is a science that studies natural phenomena related to matter and energy. Physics learning is developed based on the principle of active learning which provides opportunities for students to develop their potential [1]. Students discover facts, concepts, and phenomena in everyday life through learning physics. One of them in learning waves in class XI, namely lightning and lightning occur simultaneously. In fact, lightning is seen before lightning, this is because light travels through the air faster than sound.

Physics is a subject that is closely related to the environment or everyday life. Physics is a branch of science that underlines the development of technology and concept of living in harmony with nature [2]. Physics can be interpreted as a lesson that is closely related to natural phenomena so that it gets the rules or laws in physics [3].Learning physics should be able to make students solve problems and find knowledge, so good teaching materials are used to improve student learning outcomes, there are several types of media that can be chosen in learning such as Student Worksheets. Student Worksheets are written with the aim that students can study independently without or with teacher guidance so that students are able to analyze and solve a problem so as to improve student learning outcomes. Student Worksheets that are designed are certainly more effective if learning is well collaborated between sources, models and approaches in learning so that the quality of the learning process will increase. The process of knowing physics through the interaction of teachers and students in a learning environment is called learning physics [4]. In physics, learning can be obtained through physical events in the natural environment, so that not only theory must be studied in this field of physics, but also requires practice in proving theories that have been studied and implemented properly [5].

Student Worksheets are printed teaching materials in the form of sheets of paper containing material, summaries and instructions for implementing learning assignments. A worksheet is a teaching material that can be developed and use to support student learning activities [6]. Student Worksheets are used as a means of student thinking to solve problems in learning. The use of Student Worksheets in the learning process makes it easier for students to interact with the material provided, increases students' mastery of the material provided, trains students' independent learning, and makes it easier for teachers to give assignments to students. The function of worksheet is to facilitate the implementation of teaching to students and as teaching materials that can minimize the role of educators but can activate students [7]. Student Worksheets are teaching materials in the form of worksheets or student learning activities [8]. Worksheets is the simplest teaching material because the main components in it are not a description of the material, but rather a number of activities that students can do, according to the demands of KD in the curriculum or learning indicators.

Learning outcomes are one of the important things in the learning process. Learning outcomes are an ability achieved by students after going through a certain series of learning processes [9]. Learning outcomes in the 2013 Curriculum cover three domains, namely in the realm of knowledge, attitudes, and skills. The domain of knowledge includes the level of ability to remember, understand, apply, analyze, evaluate, and create. The domain of attitudes includes attitudes, personality, religious and social. On the other hand, the realm of skills includes skills, hard work and student activities. So, the competence of students will be achieved well if all student learning outcomes are also achieved.

The reality in the field has not described the expected conditions based on the analysis of the journals collected. There are some real conditions found in the journal. The first real situation is that learning is still teacher centered [10] and the teacher is the main source of information for students [11]. Teachers rarely involve the active role of students in the learning process [12] making students tend to be passive, so that in the learning process students are required to understand everything that is conveyed by the teacher [13]. Causing students to be reluctant to think and tend to just accept the material without considering it.

The second real situation is that learning physics is still not attracting students' interest and attention [14]. The monotonous learning of physics makes students not interested in learning [15] so that students are lazy to ask questions and lack interaction with educators and with other students. Learning becomes monotonous because it does not connect the concepts being studied with students' prior knowledge [11]. As a result, students are not trained to apply the concepts they have learned to solve problems in everyday life. Physics learning has nothing to do with phenomena in everyday life, as a result, students' physics learning outcomes are low [16]. This also happened to the average high school physics learning outcome in West Sumatra in 2019 based on the UNBK which was 47.5[17].

The third real situation is that the teaching materials used are still conventional [18]. Student Worksheets used by students come from certain publishers and worksheets made by subject teachers [19]. In the appearance of the media, the teacher only provides an explanation of the material, causing the learning process that takes place to be dominated by the teacher [20]. With physics material that is abstract, and difficult to understand by students [15] which can cause students to only memorize formulas and result in a lack of understanding of the initial concepts of physics in students.

Based on the review that the author conducted on 30 articles that met the expected criteria, the effect of using Student Worksheets on student learning outcomes had different results. Some are classified as low, medium high and even very high. This indicates a significant contradiction for the same variable in various studies. Therefore, the researcher wants to integrate all information in order to conclude the effect size value which states the extent of the relationship between the use of Student Worksheets on student learning outcomes in these various studies by using the meta-analysis method. In addition, this study also aims to determine the truth of a study containing the same research variables.

Meta-analysis is a way to summarize, integrate, combine, and interpret the results of selected studies in certain fields of science [21]. Meta-analysis is a form of research, using data from other existing studies. Meta analysis collects studies with relevant topics. Then processed and made statistical conclusions. Therefore, meta-analysis is a quantitative method by means of research analyzing quantitative data from the results of previous studies. Meta-analysis can be interpreted as an analysis of the analysis [22]. Meta-analysis is a term for showing a quantitative and systematic approach to looking at existing studies [23]. Effect size is a measure of the practical significance of research results in the form of a measure of the magnitude of correlation or difference, or a measure of the magnitude of the effect of one variable on other variables.

This meta-analysis research is the right solution for researchers to choose. Meta-analysis research can summarize some of the same research and be classified into several groups in general. This research can be done for several reasons. First, this research can see the consistency of the research results that have been carried out. Second, this research can present research results in a wider scope. Third, this study can determine the effect size of a study. Fourth, this research can draw conclusions from broader studies. So meta-analysis is an increasingly popular research method used to summarize the results of broader studies.

Based on the background of the explanation, the researcher is interested in conducting a meta-analysis of the effect of using Student Worksheets on student learning outcomes. The purpose of this study was to see how much influence the Student Worksheet had on learning outcomes in physics learning which was reviewed based on education level, grade level, learning model and research area. Therefore, the title of the research is "Meta Analysis of the Effect of Using Student Worksheets on Student Learning Outcomes".

II. METHOD

The type of research used is a meta-analysis research that summarizes various studies using a quantitative approach. Meta-analysis is a secondary integrative analysis by applying statistical procedures to the results of testing research hypotheses. Meta-analysis is a word that refers to a quantitative and systematic method of reviewing previous studies. Meta-analysis is included in one type of systemic review. Systematic literature review means identifying, evaluating, and interpreting all available relevant studies for a particular research question, or a particular topic area or phenomenon of interest to the researcher [24]. Meta-analysis is quantitative because it uses numerical calculations and statistics for practical purposes, namely compiling and extracting information from so much data that is not possible with other methods.

To determine the articles used there are 3 criteria. First, the articles used are the latest publications. Second, there is information that supports the meta-analysis, namely the information needed in the form of control variables, dependent variables and moderator variables. Third, there is descriptive statistical information to obtain the effect size, namely the information needed to obtain the Effect Size value, namely the average score of the pretest and posttest results, the average score of the experimental class and the control class.

This research design consists of three stages. The first stage is the preparation stage where the researcher determines the domain based on the independent variable, the dependent variable, and the moderator variable. After that, the researchers set the research criteria based on the form of publication and year of publication. Furthermore, the researchers set an operational definition of the dependent variable, for example the increase in student learning outcomes in physics learning obtained by students, both pre-test and post-test, which was expressed in the form of scores. The next stage is the implementation stage where at this stage the researcher begins to search for and collect the articles obtained then the researcher divides them into several criteria, which include education level, learning model, and region. Data analysis is the last step. Researchers tested effect sizes based on target factors and methodological variables in this step. Then the researcher grouped the articles with low, medium, high, and very high effect sizes. After that, they make a summary in a scientific report.

This study has three variables, namely independent, bound, and moderator. The independent variable in this study is the learning video, while the dependent variable is student learning outcomes. The moderator variables in this study were the level of education, the learning model at the high school level, and the region.

This study uses a meta-analysis method that was conducted on 30 articles related to the effects of using student worksheets published in 2014-2021. The analytical technique used is a quantitative approach with calculations and data analysis in the article. To facilitate data analysis, data tabulation was carried out with the following steps: (1) Identifying the variables found, (2) Identifying the mean and standard deviation of the experimental and control groups (3) Calculating the effect size with the following equation.

$$ES = \frac{(\bar{X}_{post} - \bar{X}_{pre})_E - (\bar{X}_{post} - \bar{X}_{pre})_C}{\frac{SD_{preC} + SD_{preE} + SD_{postC}}{3}}$$

After finding the effect size results based on the above formula, effect size criteria can be seen in Table 1.

Table 1. Interpretation of *Effect Size*

Effect Size	Category
ES ≤ 0,15	*Very Low*
0,15 < ES ≤ 0,40	*Low*
0,40 < ES ≤ 0,75	*Medium*
0,75 < ES ≤ 1,10	*High*
ES > 1,10	*Very High*

(Source: Ref [25])

Based on Table 1, the value *effect size* with a small effect size of 0.15 can be ignored while the effect size from 0.15 to 0.40 is included in the low category. The effect size from 0.40 to 0.75 belongs to the medium category. The effect size from 0.75 to 1.10 is included in the high category And a large effect size of 1.10 includes a very high effect criterion.

After interpreting various research studies, it will be known how the effect of using video on learning outcomes in high school physics and junior high school science subjects based on education level, learning model, and region by calculating Effect Size using the described formula.

III. RESULTS AND DISCUSSION

A. Research result

The magnitude of the influence obtained from the research sample is divided based on four factors, namely based on education level, grade level, learning model and research area, based on the results of the analysis conducted on 30 articles.

1.   Education level.
The results of the analysis related to the effect of using student worksheets toward student learning outcomes based on education level, obtained a summary of the effects which can be seen in Table 2.

Table 2. The Summary Effect Size For The Education Level

Education Level	Article Code	Summary Effect Size	Criteria
SMP	A4	1.041	**High**
	A5		
	A12		
	A16		
	A17		
	A22		
	A23		
	A24		
	A25		
	A26		
	A27		
	A29		
SMA	A1	0.939	**High**
	A2		
	A3		
	A6		
	A7		
	A8		
	A9		
	A10		
	A11		
	A13		
	A14		
	A15		

A18
A19
A20
A21
A28
A30

Based on the table above, which is the result of using student worksheets based on education level, it can be seen that the biggest influence is at the junior high school level, with the magnitude of the effect being 1.041 in the high category. In addition, while at the high school education level, the magnitude of the influence is 0.939 in the high category. Seeing the high summary effect size results from the two levels of education, it can be interpreted that student worksheets are very influential in the learning process and are also well used to improve student learning outcomes.

2. Grade level

The results of the analysis related to the effect of using student worksheets toward student learning outcomes based on grade level, can be seen in Figure 1.
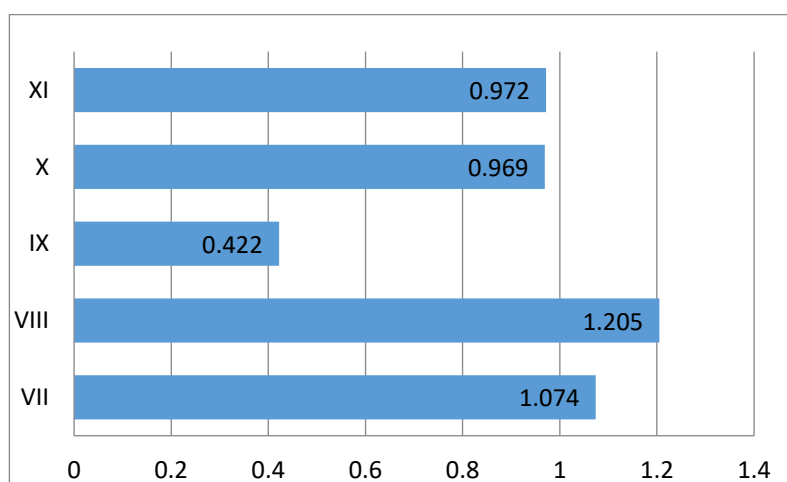

Fig. 1. Graph summary effect size by grade level

Based on Figure 1 which is the result of the summary effect size of the use of worksheets by grade level. The grade levels in this study were grades VII, VIII, IX, X and XI. Based on the picture above, it is known that learning using worksheets has the greatest effect in class VIII with a *summary effect size* of 1,205 in the very high category and gives the smallest effect in class X with a *summary effect size* of 0.422 which is included in the medium category. However, when viewed as a whole, from the summary of the effect size obtained, it can be interpreted that the use of student worksheets is very influential in the learning process and is also well used to improve student learning outcomes.

3. Learning model

The results of the analysis related to the effect of using student worksheets toward student learning outcomes combined with learning models can be seen in Figure 2.
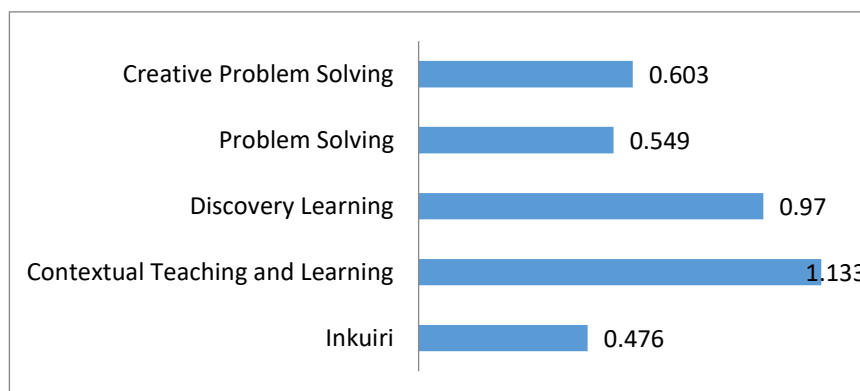
Fig. 2. Graph of summary effect size based on the learning model

Based on Figure 2 which is the result of the summary effect size, the use of student worksheets is combined with the learning model. it is known that learning using worksheets has the greatest effect when combined with the Contextual Teaching and Learning with summary effect 1,133 size which belongs to the very high category and gives the smallest effect when combined with the Inquiry with general effect size of 0.476 which belongs to the medium category. However, if viewed as a whole, from the summary of the effect size obtained, it can be interpreted that the use of student worksheets with learning models is very influential in the learning process and is also well used to improve student learning outcomes.

4. Research area

The results of the analysis related to the effect of using student worksheets on learning outcomes based on the research area can be seen in Figure 3.
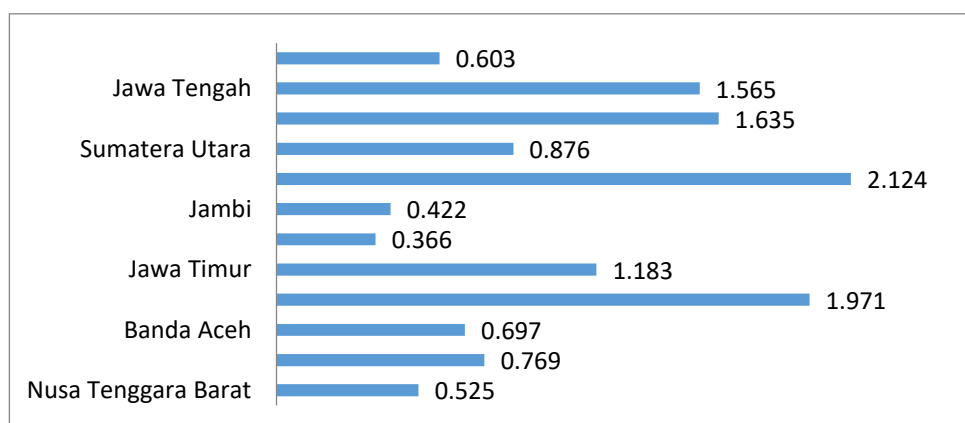

Fig. 3. Graph of summary effect size based on the research area

Based on Figure 2 which is the result of using student worksheets based on the research area, it can be seen that it is known that learning using worksheet has the greatest influence in Bengkulu province with a summary effect size of 2,124 which is classified in the very high category and has the least effect in Java province. West with a summary effect size of 0.366 which belongs to the low category. However, if viewed as a whole from the summary of the effect size results obtained, it can be interpreted that the student worksheets very influential in the learning process and also well used to improve student learning outcomes in Indonesia.

B. Discussion

Based on the calculations that have been done, it is known that the Summer Effect Size value of the effect of using LKS on student learning outcomes has varying values. This value is obtained from 30 articles that have been analyzed and meet the article criteria.

Summary effect size of the effect of using worksheet on learning outcomes at the junior high school level is 1,041 which is classified in the high category, with a standard error of 0.0961. If the degree of confidence is 95% ($\alpha = 0.05$) and the value of the two-party test (p) is 0.000. Where $p < 0$, it means that H_0 is rejected and the use of worksheets has an influence on student learning outcomes at the junior high school level. Summary effect size of

the effect of using LKS at the high school level is 0.939 which is classified in the high category, with a standard error of 0.0744. If the degree of confidence is 95% ($\alpha = 0.05$) and the value of the two-party test (p) is 0.000. Where p<0, it means that H_0 is rejected and the use of worksheets has an influence on student learning outcomes at the high school level. Based on the summary effect size value, the effect of using LKS at the level of education is greater in junior high school by 1,041 in the high category. This indicates that the use of worksheets for levels has an influence on good learning outcomes. In line with the article worksheets has an effect on student learning outcomes [26]. This is because worksheets present concepts that can strengthen students' understanding of the material. In the worksheets there are also evaluation questions to strengthen students' understanding of the material that has been studied.

Based on the summary effect size value that has been obtained from the effect of using worksheets on learning outcomes based on grade level. The class level that has the most influence is class VIII with a very high category. At each grade level the use of worksheets affects learning outcomes. Then the use of worksheets for each grade level can be used properly.

Based on the summary effect size value, the effect of using worksheets on learning outcomes is combined with the learning model. The learning model that has the most influence is the Contextual Teaching and Learning (CTL) model with a very high category. Learning using worksheets teaching materials combined with the CTL model has an effect on improving student learning outcomes. This statement is in line with the article that the worksheets assisted CTL learning model has a higher final ability, because students are more active during learning and can directly relate the material being studied to phenomena in everyday life according to the characteristics of the CTL learning model [16].

Based on the research area there are 12 provinces obtained from the article. The areas of Lampung, East Java, Bengkulu, Jakarta, Central Java have a great influence with a very high category. West Sumatra and North Sumatra are categorized as high. Meanwhile, West Nusa Tenggara, Banda Aceh, Jambi, West Kalimantan are categorized as moderate. The influence that has a small effect is the West Java region with a low category. Based on the summary effect size value, the effect of using worksheets on learning outcomes is based on the research area. Bengkulu Province has the most influence with a very high category. This shows that the use of worksheets in learning based on the research area is effective for improving student learning outcomes.

IV. CONCLUSION

Based on the results of meta-analysis with summary effect size calculations, there are four moderator variables that have been determined, it can be concluded that the effect size of the use of worksheets on learning outcomes has the greatest influence (1) based on junior high school education level with a summary effect size of 1,041 in the high category , (2) in class VIII with a summary effect size of 1,205 which is categorized as very high, (3) in the Contextual Teaching and Learning (CTL) model with a summary effect size of 1,133 which is categorized as very high, (3) in Bengkulu Province with a summary effect size of 2,124 which is categorized as very high.

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