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Comparation Inkuiri-Belding Learning Models with Jigsaw Cooperative Models on Physics Learning Outcomes

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ABSTRACT

Most important factors in determining pupils' academic success are the ability of teachers to plan and carry out lessons. Teachers can improve learning outcomes by choosing a suitable instructional model that is in line with the learning goals and the content to be delivered in the classroom. The objective study is examining disparities on physics learning achievements among Grade X students at SMAN 1 2x11 Enam Lingkung who were instructed using the Inquiry-Belding Learning models versus those who were instructed using the Jigsaw Cooperative models. The study used a quasi-experiment methodology employing a posttest-only control design. The study sample comprises Grade X students enrolled at SMAN 1 2x11 Enam Lingkung for the academic year 2023/2024. The sample was chosen via purposive sampling, with Class X.1 as the first experiment group and Class X.2 as the second experiment group. The research data comprises the academic achievements of students in the field of knowledge. Examples of data gathering equipment encompass the utilization of multiple-choice examinations. The employed data analysis procedures include descriptive analysis, normality test, homogeneity test, and hypothesis testing with a significance level (α) of 0.05. The data analysis indicates that the average learning outcomes for the first experimental group were 75.429, but for the second experimental group, it was 65.000. The results of the hypothesis testing conducted on the posttest scores indicated that the calculated t-value (t_calculated) was 3.781, which was more than the critical t-value (t-table) of 2.010. This suggests that the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is accepted. There is a notable distinction between pupils instructed using the Guided Inquiry style and those taught with the Jigsaw Cooperative learning methodology for the subject of alternative energy.

Keywords : Guided Inquiry; Jigsaw; Learning Results.

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I. INTRODUCTION

Individuals must be adequately prepared to face the world's changing landscape due to the rapid advancement of science and technology, particularly in education. In the 21st century, education gets to be exceptionally vital to guarantee learners have learning and imaginative aptitudes, abilities utilizing innovation and information data, work, and survive by utilizing life aptitudes [1]. As indicated by Article 3 of Regulation No. 20/2003 on the Public School System, the reason for public instruction is to improve abilities and develop the qualities and culture of a regarded country, determined to teach its residents. The goal is to help students become strong believers in and devotees of God Almighty, have good character, stay healthy, learn new things, show their ability and creativity, foster independence, and eventually become democratic and responsible members of society. Law No. 20 of 2003 on general provisions defines the curriculum as a comprehensive framework that encompasses learning objectives, content, teaching materials, and techniques. It serves as a guide for educational institutions to effectively carry out learning activities and accomplish certain educational goals. A "Kurikulum Merdeka" is the current curriculum. The "Kurikulum Merdeka" was officially introduced in 2022 by the Kemendikbud-Ristek as a means of restoring the learning process.

The “Kurikulum Merdeka” offers several benefits, including: (1) A focus on fundamental content and the cultivation of students' abilities, resulting in a curriculum that is both streamlined and profound; (2) The absence of specialised programmes for high school students, granting teachers and students greater autonomy in the educational journey. Students have the freedom to select subjects according to their personal interests and abilities, while teachers have the flexibility to adapt their teaching methods to match the students' stages of growth and accomplishments; (3) This approach promotes more interactivity and relevance in the learning process. These three advantages of the “Kurikulum Merdeka” demonstrate that it offers a wider range of chances for students to cultivate their interests and abilities, enabling them to be more engaged and involved in both the school and community settings [2].

Physics is the science that studies natural phenomena. As a science that investigates regular peculiarities, physical science gives important illustrations to people to live as one with the laws of nature. Because physics is related to the systematic investigation of environmental natural phenomena, It's not just about knowing the facts, ideas, or principles; it's also a process of finding out. [3]. Physics education aims to develop students' ability to analyse and interpret natural and environmental phenomena using physics ideas and principles. It also aims to enhance their problem-solving skills in relation to these concepts and principles [4]. During the study of physics, students must actively engage in order to fully comprehend the subject matter and gain the ability to apply it in practical situations. This enhances the educational experience, making it more significant and impactful.

Another essential skill for teachers to possess is the capacity to organize and carry out examples when students are studying material science. To optimise student engagement and information acquisition, a teacher should skillfully employ suitable teaching models, hence fostering an effective and engaging learning atmosphere [5]. To boost students' physics accomplishments, educators may incorporate cutting-edge instructional frameworks like inquiry-based learning and cooperative learning models to maximize student involvement. The development of skills in the areas of observation, analysis, and problem-solving in the field of physics are included among the physics learning outcomes [6]. According to [7] Physics learning outcomes refers to the measurable achievements of students' learning in physics, which are often stated by letters, figures, or words, following the completion of the teacher-led physics instruction.

The current state of affairs in the field falls short of the anticipated circumstances. The students' performance in physics learning remains relatively poor, and the physics learning outcomes are suboptimal. According to the conducted observations [8] The observation at SMAN 1 2x11 Enam Lingkung indicates that the learning process is currently suboptimal. This is demonstrated by the inadequate attainment of students' physics skills, mostly attributable to the majority of students exhibiting reduced engagement throughout learning sessions. According to the Kemendikbud's Centre for Educational Assessment, students at SMAN 1 2x11 Enam Lingkung received an average score of 39.58 on the 2019 Physics National Computer-Based Exam (UNBK), indicating a poor performance. In addition, researchers at SMAN 1 2x11 Enam Lingkung have observed that the learning results are low. The average final test score of tenth-grade students in the first semester of stage E is below the minimal learning mastery threshold set by the school, which is 78.

In order to tackle these problems, it is imperative to use cutting-edge instructional frameworks that are in line with the students' attributes and the existing facilities and infrastructure. The guided inquiry learning paradigm is seen appropriate for resolving students' challenges in the physics learning process as it has the capacity to shape and enhance fundamental ideas and students' proficiency, fostering independent thinking and proactive engagement, characterised by integrity and transparency. Moreover, this methodology enhances the learning process by promoting active engagement and granting students the autonomy to study autonomously [9]. Inquiry learning requires students to find their own solution to a problem based on real data as a result of their observations [10]. According to [11] inquiry learning has six characteristics, namely: (1) students learn actively in experience, (2) students learn based on what they know, (3) students develop a series of thoughts in the guidance process, (4) student development occurs continuously gradually, (5) students have different ways of learning, (6) students learn through social interaction with other people.

According to the findings of a study done by [12] using the guided inquiry approach in high school physics education has a notable and beneficial impact on students' academic achievements and their attitudes towards science. This is in line with what a study by [13] found, which stated that students can enhance their critical thinking abilities and physics learning outcomes by utilizing the guided inquiry paradigm. Another excellent teaching technique, in addition to the guided inquiry paradigm, is the cooperative learning jigsaw model. This model places emphasis on students' comprehension of topics [14]. The cooperative learning jigsaw paradigm entails students assuming accountability for acquiring knowledge and instructing their colleagues, hence increasing their engagement in the learning process [15]. Every individual from the gathering is liable for realizing what is introduced and helping his kindred individuals to learn. When this collaboration takes place, the team creates an atmosphere of achievement, and subsequently learning is enhanced [16]. The use of the cooperative jigsaw has been found to increase students' enthusiasm for studying and their physics academic accomplishments in previous research, such as [15].

From the foregoing description, it is evident that both the guided inquiry and the cooperative jigsaw have the potential to enhance students' learning results in physics. Hence, the researcher intends to carry out a study entitled "Comparation of Inkuiri-Belding Learning Models with the Jigsaw Cooperative Models on Physics Learning Results of X SMAN 1 2x11 Enam Lingkung."

II. METHOD

The study utilises a quantitative research methodology. The objective is to assess the efficacy of the guided inquiry and the cooperative jigsaw model in improving learning outcomes about Alternative Energy for Grade X students at SMAN 1 2x11 Enam Lingkung. The research to be done will utilise a quasi-experimental design. This research methodology is employed because to the inclusion of human participants in the study, which necessitates the researcher's inability to exert complete control over all factors. The research strategy employed in this study is the Posttest-Only Comparison Group strategy, which entails the allocation of two distinct classes or groups, with each group receiving different treatments.

The population refers to the complete set of research subjects, encompassing individuals, objects, animals, plants, phenomena, test scores, and events that possess unique features within a study [4]. The participants in this study are all Grade X students at SMAN 1 2x11 Enam Lingkung, with 242 students spread out across seven classrooms. The characteristics of the sample are identical to those of the population as a whole. Purposive sampling is the non-random and deliberate method of sampling used in this study. It is based on specific criteria and goals.

The researchers chose the sample based on the pupils' scores. The two classes selected as examples for this study possess comparable capabilities and were provided with identical instructional materials. The sample classes in this study include class X1, designated as the first experiment class, including 36 students who will be exposed to guided inquiry learning. Class X2, designated as the second experiment class, consists of 36 students who will be engaged in cooperative jigsaw learning.

A research variable refers to a characteristic, property, or value of individuals, things, or activities that exhibit variation and are examined by the researcher in order to make conclusions [17]. Independent factors, dependent variables, and control variables are the three distinct research variables in this investigation. The autonomous variable is the element that instigates modifications or applies an effect on the reliant variable. As independent variables, the study investigates the inkuiri-belding learning models and jigsaw cooperative models. The reliant variable is the variable that goes through changes in light of varieties in the autonomous variable and is impacted by the free factor [17]. The students' learning outcomes are the variable being measured in this study.

In accordance with reference [17] The variable that is manipulated or maintained at a constant level is the control variable. This is finished to guarantee that the independent variable's impact on the reliant variable is unaffected by unstudied elements. In comparative studies, control variables are frequently used.The independent factors in this study consist of the learning content, time allocation, teacher, quantity and kind of exam questions, learning environment, and evaluation procedures.

Data refers to a compilation of factual information acquired via study. Data is categorised into two distinct groups based on its origin: essential sources and optional sources. Essential sources are defined as sources that directly supply data to the data collector, whereas optional sources are those that provide the data collector with te data indirectly [18]. The study relies mostly on the data about students' learning results, with secondary sources being utilised solely for early investigations.

This study utilises a cognitive assessment tool in the form of a physics exam administered to students. The test has 35 multiple-choice questions and is designed to measure their learning results. Prior to being utilised for the posttest, the questions undergo testing to ensure their content validity, reliability, difficulty level, and discriminating power. The study examines students' learning outcome data by employing descriptive and inferential analysis to evaluate the hypotheses.

Normality and homogeneity tests are employed for data analysis. Utilize the Lilliefors test to decide whether the population follows a normal distribution test of normality. Using the Fisher test, the homogeneity test is carried out to see if variances of two sample data sets are comparable. A hypothesis test is carried out when the data exhibit equal variances and a normal distribution. The hypothesis test's objective is to validate the hypothesis that has been presented. Independent sample t-test was used to test the hypothesis in this study. Testing rules expresses that the invalid speculation (H0) is acknowledged whether the determined test measurement (t) is not exactly the basic worth (t). After the data have been processed and analyzed, conclusions can be drawn.

III. RESULTS AND DISCUSSION

Results

The study took place at SMA Negeri 1 2x11 Enam Lingkung from January 23 to February 20, 2024. The collected study results encompassed the learning outcomes of Grade X.1 (first experiment class) and X.2 (second experiment class) students for the Physics curriculum, specifically on the topic of Alternative Energy. The learning outcomes comprised the evaluation of the pupils' knowledge. The data on students' knowledge evaluation were collected from the posttest results administered at the conclusion of the learning process for both experimental classes. Descriptive and inferential statistical analysis are used to clarify the study's knowledge element results. The research on students' knowledge evaluation yielded the following results.

1. Descriptive Analysis

The first experimental class (X.1) underwent treatment utilising the guided inquiry learning paradigm in the physics topic focused on Alternative Energy. Meanwhile, the second experimental class (X.2) used the cooperative jigsaw learning approach, focusing on the same subject matter as the first experimental class. Students in both classes took a posttest to assess their knowledge acquisition outcomes after the learning process had concluded. A written assessment with 20 multiple-choice questions supported by a question grid was used for the posttest. The students' learning outcomes in the first and second experimental classes were assessed using posttest scores. These scores were then organised in ascending order and displayed in Table 1.

Table 1. Students' Posttest Results

No	First Experimental Class			Second Experimental Class		
	Score	**Frequency**	**Percentage**	**Score**	**Frequency**	**Percentage**
1	45	1	2.86%	30	1	3.13%
2	50	1	2.86%	40	1	3.13%
3	55	1	2.86%	45	1	3.13%
4	65	1	2.86%	50	2	6.25%
5	70	6	17.14%	55	1	3.13%
6	75	10	28.57%	60	5	15.63%
7	80	8	22.86%	65	6	18.75%
8	85	4	11.43%	70	6	18.75%
9	90	2	5.71%	75	5	15.63%
10	95	1	2.86%	80	3	9.38%
11	-	-	-	85	1	3.13%
Total		35	100%		32	100%

Table 1 reveals that the minimum score attained by students in the first experimental class is 45, with just one student achieving this number. Conversely, the maximum score obtained is 95, again achieved by only one student. In the second experimental class, there is one student who scored the lowest with a score of 30, and one student who scored the most with a score of 85. Descriptive statistics can be used to compare the students' learning outcomes in the first and second experimental classes based on the scores and frequency of the students. The data in Table 2 provides a descriptive analysis of the knowledge scores of pupils.

Table 2. Descriptive Statistics of Student Learning Outcomes

No	Descriptive Statistic	First Experimental Class	Second Experimental Class
1	Number of Samples	35	32
2	Maximum Score	95	85
3	Minimum Score	45	30
4	Mean	75,429	65,000
5	Standard Deviation	10,316	12,247
6	Variance	106,429	150,000

The students' average score in the first experimental classes is higher than that of students in the second experimental classes, as shown in Table 2. The second experimental class has larger standard deviation and variance compared to the first experimental class, suggesting a greater degree of diversity in student performance within the second experiment class.

A descriptive study of the students' learning outcomes in the first and second experimental classes allows us to compare the average learning outcomes of the two classes. Figure 1 depicts the knowledge score comparison between the cooperative jigsaw learning model-using class and the guided inquiry using class.

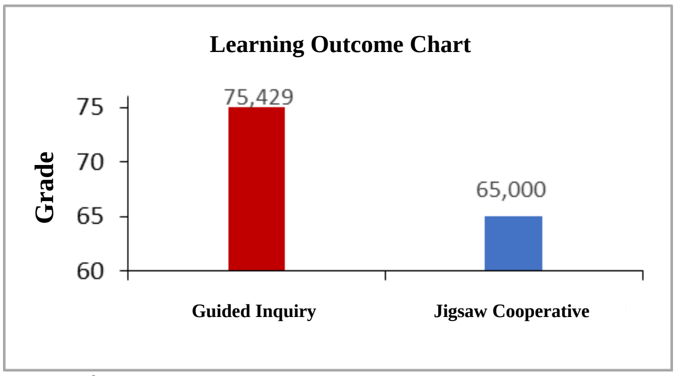

Fig 1. Graph of Average Student Learning Outcomes in Both Experiment Classes

Figure 1 clearly demonstrates the disparity in average learning outcomes between the cooperative jigsaw learning model and the guided inquiry. Figure 1 shows that students in the guided inquiry learning class have a higher average knowledge score than students in the cooperative jigsaw learning model class. The directed request class procured a normal score of 75.429, however the helpful jigsaw class acquired a normal score of 65.000. he normal for the directed request learning model class is 10.429% higher than the normal for the agreeable jigsaw learning model class.

2. Inferential Analysis

a. Test of normality

The normality test was used to decide whether the students' learning outcomes test data in both of the experimental classes were normally distributed. The Liliefors test, which has an importance level of 0.05, fills in as the ordinariness test. Table 3 shows the ordinariness test results for the main exploratory classes and the second trial classes, which used the directed request learning model and the Jigsaw helpful learning model, separately.

Table 3. Normality Test Results

Class	N	α	Lh	Lt	Remarks
X 1	35	0,05	0,107	0,150	Normal
X 2	32		0,060	0,157	Normal

In view of the normality test results introduced in Table 3, Lh and Lt costs were gotten at a significant level (α) = 0.05 for n = 35. The class that employs the guided inquiry has a Lh value of 0.107, whereas the class that employs the cooperative jigsaw has a Lh value of 0.060. In light of the fact that the data obtained is the value of Lh < Lt in both classes, it is possible to draw the conclusion that the knowledge value in both of the experimental classes is equally normal.

b. Test of homogeneity

Homogeneity's test was conducted to see if the two experimental classes had homogeneous data variances. The homogeneity test conducted was the F test. Data from homogeneity's test results for the two experimental classes, namely the class that applied the guided inquiry and the class that applied the Jigsaw cooperative, are presented in Table 4.

Table 4. Homogeneity's Test Results

Class	N	$\bar{X}$	S	S^2	F_h	F_t	Remarks
X 1	35	75,429	10,316	106,429	1,409	1,789	Homogen
X 2	32	65,000	12,247	150,000			

The comparison of data with the highest variance value and data with the lowest variance value yielded the homogeneity's test results for both the guided inquiry and the jigsaw cooperative classes. From the comparison results, the homogeneity value Fh = 1.409 and Ft = 1.789 with a significant level (α) = 0.05, dk1 = 34 and dk2 = 31. Based on the homogeneity' test result that has been carried out, it shows that Fh < Ft, which means that the data in the two experimental classes come from populations that have homogeneous variances.

c. Hypothesis Test

The results of the prerequisite tests, which were tests of normality and homogeneity, demonstrate that the data in classes that employ guided inquiry learning models and jigsaw cooperative learning models are normally distributed and have homogeneous variances. Hypothesis testing, which aims to confirm the study's hypothesis or provide an answer, is carried out if the data are found to be normal and homogeneous. The independent sample t-test is hypothesis test used. Information of the speculation's test results are introduced in Table 5.

Table 5. Hypothesis Test Results

Class	N	$\bar{X}$	S	S^2	t_h	t_t	Remarks
X 1	35	75,429	11,279	127,209	3,781	2,010	There is a difference in physics learning outcomes
X 2	32	65,000					

From hypothesis test data presented in Table 5, the results obtained th = 3.781 > tt = 2.010, so H0 is rejected. That is, students utilizing the Jigsaw Cooperative achieve significantly different learning outcomes than students utilizing the guided inquiry learning.

Discussion

Purpose of research was to compare the student's learning outcomes studying alternative energy who were taught using the cooperative jigsaw and those who were taught using the guided inquiry. The knowledge aspect was the assessed learning outcome in this study. A t-test with a significance level of $\alpha = 0.05$ was used to test the hypotheses in order to accomplish the goals of the study. The data from the two experimental classes needed to be checked for normal distribution and homogeneous variances prior to hypothesis testing. Therefore, before the hypothesis testing, the learning outcomes data obtained from the posttest in both classes were first subjected to normality and homogeneity tests.

The normal distribution of the learning results of students in both experimental courses was evaluated using the Lilliefors test. The Lilliefors test revealed that the students' learning outcomes in the first experimental classes had a computed L value of 0.107. The result of the calculation demonstrates that L_calculated has a value of 0.107, which is lower than L_table's value of 0.150. The students in the first experimental class, who were instructed using the guided inquiry learning approach, had normal learning outcomes. Meanwhile, the Lilliefors test yielded an estimated L value of 0.060 for the students' learning outcomes in the second experimental classes. The data shows that the value of L_calculated is 0.060, which is less than the value of L_table, which is 0.157. Therefore, the learning results of students in the second experimental classes, who were taught using the cooperative jigsaw learning approach, exhibit a normal distribution.

On both of the experimental classes, homogeneity tests were carried out with the F-test. In the wake of examining the information, it was found that the registered F an incentive for the learning results of understudies in the first experiment class and the second experiment class was 1.409. With 35 students in the first experiment class and 32 students in the second class, the F-table value was 1.789 at a significance level of 0.05. The information demonstrates that the determined F_value (F_calculated) is 1.409, which is not exactly the postponed F_value (F_table) of 1.789. As a result, it can be deduced that the students whose learning results are influenced by the cooperative jigsaw and the guided inquiry are both members of the same population.

The learning outcomes data collected from both courses satisfied the criteria of being normally distributed and having equal variances. After that, the hypothesis was tested to see if there was a significant difference in learning results between students who were taught using the cooperative jigsaw learning and those who were taught using the guided inquiry learning. Accept the alternative hypothesis (H1) if the calculated t_value (t_calculated) is greater than the critical t_value (t_table) during hypothesis testing. The value of t_calculated as a result of the data analysis was 3.781. According to the data, the calculated t_value (t_calculated) is greater than the critical t_value (t_table), which is 2.010. A significance level (α) of 0.05 and a degree of freedom (df) of 65 serve as the foundation for this. Thus, the computed value is within the critical zone of the null hypothesis (H0), leading to the rejection of H0 and acceptance of the alternative hypothesis (H1). This suggests a considerable disparity in learning outcomes between the two experimental classes.

The findings of this study demonstrate a notable disparity in physics learning achievements on Alternative Energy between the group that employed the guided inquiry approach and the group that employed the cooperative jigsaw approach. The posttest results indicated that the class implementing the guided inquiry achieved superior learning outcomes in comparison to the class employing the cooperative jigsaw learning model. The students' average learning outcome for the first experimental classes was 76.429, whereas the second experimental classes was 65.000.

The disparity students' learning outcomes who utilized guided inquiry and those who employ cooperative jigsaw might be attributed to the contrasting instructional procedures or syntax of the two models. The learning model's syntax governs the manner in which students engage in learning activities inside the classroom.

The benefits of the guided inquiry methodology encompass: (1) fostering a student-cantered approach to the learning process. According to a psychological principle of learning, the level of a student's engagement in learning activities directly correlates with their ability to fully experience the learning process. Hence, in order to enhance the calibre of educational achievements, it is imperative to provide students with increased possibilities to actively and cognitively participate in the educational process. The guided inquiry learning approach involves active participation of students, both physically and cognitively, in the learning process. In this style, teacher's role is a facilitator and mediator. (2) Developing self-perception. Inquiry activities can enhance the learning process and foster the development of students' self-concept. Every student have a self-concept, and if it is optimistic, the student will enjoy psychological security, be receptive to novel experiences, and have faith in their abilities. (3) Raising levels of expectation. Students possess distinct notions on independent task completion. By engaging in a range of inquiry activities, children acquire valuable skills in applying their own ideas to independently examine and solve issues, leading to successful outcomes. (4) Fostering the growth of personal abilities and expertise [19]

According to [20] the inquiry approach has several advantages, including its emphasis on the holistic development of cognitive, emotional, and psychomotor elements, which enhances the meaningfulness of learning. (2) Facilitating an environment that accommodates individuals' individual learning preferences. (3) Consistent with contemporary educational psychology, which regards learning as a process of modifying behaviour via experience. (4) Catering to the requirements of pupils who possess exceptional skills. These viewpoints suggest that the guided inquiry has several benefits and suited for adoption in the learning process due to its student-cantered nature, which promotes more student engagement.

In guided inquiry learning activities, students are actively involved in making hypotheses, designing investigations, conducting investigations to obtain data, collecting and analysing data, and drawing conclusions. This aligns with research findings by [21] and [9] which state that guided inquiry make students active and help them discover the concepts being studied. Active student involvement in learning makes the learning experience more meaningful, as students build and understand the concepts themselves rather than merely memorizing. This is consistent with research conducted by [5] [22] [23] [24], [25], [26], [12], [27] dan [13] which found that implementing the guided inquiry make improve student’s learning outcomes outcomes.

In the guided inquiry, students are directed to find answers to their questions independently. At the beginning of the learning process, the teacher provides guidance through questions and discussions, gradually reducing guidance so that students can learn independently. Students use structured worksheets to conduct inquiry-based learning. Therefore, in the guided inquiry, students are active, which increases their engagement in the learning process. This aligns with Hamalik's opinion in [28] stating that increasing student learning activities can improve learning outcomes.

On the other hand, cooperative jigsaw learning priorities collaborative work within small groups. Students must specialize in one subject area and assume distinct duties within the group, perhaps leading them to concentrate only on their area of expertise. Furthermore, as per the researcher's findings, students in class X.2 at SMAN 1 2x11 Enam Lingkung were not entirely accountable for the assigned tasks and still relied on instructor help to achieve proficiency in the subject matter. The fundamental concept of the cooperative jigsaw model is the establishment of positive interdependence among persons [29]. This model may be compared to a puzzle that is considered unfinished unless all of its components are assembled together. This requires active engagement from every individual in collaborative tasks, with the instructional content structured in a way that ensures each group member possesses distinct knowledge and exerts influence on the group. A potential problem of the cooperative jigsaw approach at SMAN 1 2x11 Enam Lingkung is that not all students may be able to effectively integrate the many components of the curriculum, which might impede others' comprehension of the concepts. This is consistent with the findings of other studies, including those conducted by researchers [30] [31] [32], [14], [15], and [33] These studies have shown that the cooperative jigsaw learning model may enhance learning results, provided that students within a group possess a solid comprehension of the ideas and are willing to take on the duty of teaching them to their peers.

The researcher encounters challenges, especially in guiding student discussions and managing time, during the teaching process. The students were unaccustomed to assuming the responsibility of instructing their peers. The existence of social disparities between high-achieving and low-achieving students has resulted in a reluctance to be placed in the same groups. This has led to complaints about group members impeding talks.

Even though this study has some limitations, the final results show that students who used the cooperative jigsaw and students who used guided inquiry had different physics learning outcomes. The results indicate that the guided inquiry has a greater influence on the student of physics learning outcomes grades X at SMAN 1 2x11 Enam Lingkung in contrast with cooperative jigsaw.

IV. CONCLUSION

Student learning outcomes of X SMA N 1 2x11 Enam Lingkung on Alternative Energy material are significantly different the inkuiri-belding learning model and jigsaw cooperative models, according to data analysis. Understudies showed utilizing the guided inquiry model performed uniquely in contrast to those showed utilizing the jigsaw helpful learning model.

The study is limited by the use of learning models focused on Alternative Energy material in phase E X classes and direct classroom practice. Several limitations were encountered during this process, including limited teaching time, weak social relationships between high-ability and low-ability students, which affected group formation. Additionally, managing the class was challenging due to students lacking discipline, arriving late, and engaging in off-topic conversations during the learning.

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