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The Influence of the Guided Inquiry Learning Model and Scientific Attitude in Physics on Students' Science Process Skills

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Abstract: This research is the development of a true experiment using a 2x2 factorial design. The aim of the research is to: find out whether or not there is an influence of the application of the guided inquiry learning model and scientific attitudes in physics on the science process skills of class X MIA, and diagram the interaction of the learning model and scientific attitudes in physics on science process skills. The independent variable in this research is the learning model, while the dependent variables are scientific attitudes towards physics and science process skills. The population in this study was 136 students from class X MIA, while the sample was from class X MIA 3 and X MIA 4 as many as 68 people. Data from research results were obtained by giving scientific attitude questionnaire sheets to students before being taught using the learning model in research, and the science process skills test was carried out after students were taught using the learning model in research. The data analysis technique used is analysis of variance (ANOVA). Based on the results of the inferential analysis, it was obtained: first, the value of F_{count} (48.151) > F_{table} (4), it can be concluded that there is a significant difference between students who were taught the guided inquiry learning model and students who were taught using the discovery learning model, and the value of F_{count} (0.001) < F_{table} (4) then it can be concluded that there is no interaction between learning models and scientific attitudes in physics towards science process skills.

Keywords: Discovery; guided inquiry; scientific attitude; Science process skills.

Introduction

One of the competencies that is demanded by students in the 21st century is skills, these skills are better known as 4Cs (critical thinking, communication, collaboration, and creativity). The steps taken by the government to fulfill 21st century learning competencies with the implementation of the 2013 curriculum, learning in the 2013 curriculum is carried out using a scientific approach which requires students to use scientific methods in their learning (Agustin & Pratama, 2021).

In the process of scientific learning, students will be directed to carry out a series of investigative or discovery activities. The discovery of knowledge certainly requires a variety of skills, including observation, measurement, experimentation, and so on. The skills above will make it easier to discover knowledge, then called science process skills. Science process skills is a series of activities carried out by students to process and obtain the results they obtain to then turn them into new knowledge for themselves (Lestari & Diana, 2018).

One of the indicators in science process skills is that students can design experimental activities or knowledge discovery. Therefore, a learning model is needed that can accommodate experimental activities effectively. To be able to carry out effective learning, its implementation must involve students directly in discovery activities. The learning model that is

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considered suitable for growing and developing science process skills in students is the guided inquiry learning model.

The guided inquiry learning model is a learning model that actively involves students in every step of the activity. The main goal in the inquiry-based learning process lies in students' ability to understand, then identify carefully and thoroughly, and end by providing answers or solutions to the problems presented (Anam, 2017).

The type of inquiry chosen in physics learning is the guided inquiry learning model. The thing that researchers consider is using the guided inquiry model, because students are seen as still really needing guidance or direction from educators when they experience obstacles or confusion in solving problems in learning.

Refers to the learning steps in the guided inquiry learning model, which starts from formulating problems, formulating hypotheses, carrying out experiments, processing and analyzing data, testing hypotheses, and ending with drawing conclusions. The syntax of the learning model shows the relationship with the indicators contained in the science process skills, such as observing, classifying, predicting, inferring, communicating, identifying variables, formulating operational definitions of variables, formulating hypotheses, designing experiments. This is in line with the results of research conducted by Salman. et al. (2017) which found that there was a significant science process skills difference between students taught using the guided inquiry learning model and students taught using the conventional learning model.

The implementation of this learning model leads to discovery, so scientific attitudes are considered to be able to be developed with guided inquiry-based learning activities. This is in line with Amien and Roestyah's research in Suprihatiningrum (2013) which states that inquiry learning contains mental processes at a higher level, for example formulating problems, designing and carrying out experiments, collecting, analyzing data, concluding, fostering honest, objective, curious, open attitudes. etc.

The guided inquiry model is a learning model that is based on discovery and investigation, so in order to complete all investigative activities students involve attitudes. When students carry out investigations, the required attitude can be cultivated like a scientist. Another name for the attitude of scientists in completing their investigations is scientific attitude.

There are indicators of a scientific attitude, such as curiosity, respect for data, discovery and creativity, perseverance, criticality, and sensitivity to the surrounding environment. These indicators intersect with the PPP indicators. In implementing experimental (inquiry) based learning activities, it is also indirectly related to the scientific attitude of students. This is in line with the research results of Suryantari et al. (2019) that simultaneously there is a significant influence of the guided inquiry learning model assisted by concrete media on students' scientific attitudes.

Based on the results of observations made in class , (2) read a prayer and explain the learning objectives at the meeting, (3) continue with the educator dividing students into several groups and explaining the introductory material followed by giving problems that students want to solve, (4) students are then asked to enrich the material provided by the educator by reading various reference sources, (5) then the educator gives questions to the students, if possible the students will do it in class, but if not possible it will be made into an assignment to be done at home, (6) After the assignment is completed, the teacher provides an assessment and explanation regarding questions that many answered incorrectly. Referring to the syntax used in learning, it tends to be in accordance with the discovery learning model. In this research, the discovery learning model is also called the conventional learning model.

The physics learning that takes place at SMA Negeri 1 Tinambung, especially in class In learning, educators generally focus on things that are cognitive in nature, so that the impression they get of physics is that it is a subject based on memorizing formulas and theories that are difficult to understand. This was proven when researchers asked most of the students about physics lessons. Students predominantly answer, what they have to obtain is memorizing formulas.

Based on the results of interviews with educators, especially physics subjects for class X MIA at SMA Negeri 1 Tinambung. Educators stated that when tests were carried out for physics subjects, 60% of the total number of students obtained scores that did not meet the KKM. When examined, students who did not meet the KKM score were due to their inability to answer questions on indicators which included, grouping, interpreting, predicting and communicating. Question indicators that cannot be answered by students are classified as science process skills indicators. There are many students who cannot answer the questions correctly. In this way, it can be seen that the low science process skills possessed by class X MIA students at SMA Negeri 1 Tinambung. The cause of this is the students' lack of understanding in working on science process skills -based questions, so the students' science process skills needs to be trained.

The physics learning that takes place at SMA Negeri 1 Tinambung needs to be made to increase the students' science process skills. Realizing learning that can improve students' science process skills and scientific attitudes can be achieved by implementing a learning model that provides real (direct) experience to students. For example, through experimental activities. Thus, the appropriate learning model for physics learning is the guided inquiry learning model.

Method

This type of research is the development of a true experiment using a 2 x 2 factorial design. This research was carried out at SMA Negeri 1 Tinambung, located on Jalan Poros Majene Balanipa, Balanipa District, Polewali Mandar Regency.

This research was carried out by providing different treatments to the learning models used to teach the two groups sampled in the research. The experimental group was taught using a guided inquiry learning model, while the control group used a discovery learning model. The following is a 2 x 2 factorial research design as in Table 1 (Emzir, 2017).

Table 1. Interaction Factorial Experimental Design A and B

Scientific Attitude (B)	Learning model (A)	
	Guided Inquiry (A1)	Discovery (A2)
High (B1)	Y[A1B1]	Y[A2B1]
Low (B2)	Y[A1B2]	Y[A2B2]
Amount (∑)	Y[A1B1]+ Y[A1B2]	Y[A2B1] + Y[A2B2]

The population in this study were all class X MIA students at SMA Negeri 1 Tinambung. Class X MIA consists of 4 classes with a total of 136 students. Details of the number of students can be seen in Table 2.

Table 2. Distribution of Class X Students

Class	Amount of Students
X MIA 1	34
X MIA 2	34
X MIA 3	34
X MIA 4	34
Jumlah	136

Sumber: Database Sekolah (2023)

The sample in this study was chosen randomly using a simple random sampling technique by drawing lots, this was done with the consideration that all classes were considered homogeneous because class determination was not based on students' ranking and school origin. From the results, it was obtained that the experimental class X MIA 3 and the control class X MIA 4 each consisted of 34 people. Each group consists of categories of high scientific attitude towards physics and low scientific attitude towards physics. The sample for each group in the high scientific attitude category towards physics was 50% x 34 = 17 people and in the low scientific attitude category towards physics 50% x 34 = 17 people. So the target population is 4 x 17 = 68 people. This is in line with the view of Wening (2012) that if the number of test participants is <90 people, then the classification of upper class and lower class groups is used by taking 50%N as the upper group and 50%N as the lower group.

There are two types of instruments used in this research, namely a scientific attitude questionnaire sheet and a science process skills test. Obtaining data for scientific attitudes towards physics of Class control (X MIA 4). The distribution of questionnaire sheets to students in classes X MIA 1 to X MIA 4 was carried out in accordance with the physics subject schedule in each class X MIA. Class X MIA 1 was given a questionnaire on Tuesday, 28 February 2023, class X MIA 2 on Saturday, 25 February 2023, for class

Obtaining data by providing test instruments after students are taught using two different learning models. The test was given to all class X MIA separately, this was due to the limited question sheets used and the time given to distribute the test. The criteria for giving tests approved by the school are that they must be carried out during physics class hours according to each class schedule, this aims to ensure that it does not take up time from other subjects. This research was carried out in 3 stages described as follows:

Preparation phase

This stage is the initial stage of research which includes observation activities first at the research location, namely SMA Negeri 1 Tinambung which is on Jalan Poros Majene Balanipa, Balanipa sub-district, Polewali Mandar district with the aim of obtaining initial data and research samples. Some things to prepare before the research are as follows: The Learning Implementation Plan (RPP) aims to plan and prepare learning in the classroom using the guided inquiry learning model for the experimental (treated) class, namely X MIA 3 and the discovery learning model for the control class (comparator) namely class There are 2 learning implementation plans (RPP), for the lesson plan on energy and business, it is designed for 12 lesson hours (estimated implementation in 4 meetings), and for the lesson plan on impulse and momentum, 12 lesson hours (estimated implementation in 4 meetings).

Student Worksheets (LKPD) are a reference that students will use during the learning process in order to discover concepts or material. Use of LKPD when students enter the core of learning. The LKPD prepared by the researcher is adjusted to the number of meetings the researcher will hold.

The teaching materials used by researchers were adapted to the core competencies and basic competencies in class X SMA Negeri 1 Tinambung, especially in physics subjects. The main material that researchers will use is energy and work, as well as impulse and momentum.

Develop a research instrument in the form of a questionnaire sheet on scientific attitudes towards physics based on six dimensions of scientific attitudes, then make them into indicators, after being distributed to students, conclusions are obtained on scientific attitudes towards physics. The classification of scientific attitudes is divided into two, namely, the categories of high scientific attitudes and low scientific attitudes. towards physics. Develop a question instrument in the form of multiple choices according to indicators determined to measure students' science process skills after being taught using the guided inquiry and discovery learning model.

The final stage of preparation, namely the scientific attitude questionnaire instrument and scientific process skills test, is validated by experts, after which the instrument is declared valid and any invalid statements or questions are found, then the supervisor is consulted. After being checked by the supervisor, the instrument is ready to be tested on students in class X MIA 1 and class X MIA 2.

Implementation Stage

After the research instrument created by the researcher passes the expert validation stage (expert justification), and continues with empirical testing (trial) at this stage because there is a question instrument, it is required to be tested for difficulty, different power test and answer pattern (based on the results obtained from the test then the questions are revised), the revised questions are continued with a validity test and a reliability test. The instrument which was declared valid by 3 experts was continued with limited trials (empirical testing). First, the empirical test was carried out on classes that were not included in the research sample category, namely 53 students.

Then a validity and reliability test was carried out based on the data that had been obtained. The research was carried out by distributing scientific attitude questionnaire sheets towards physics which had been prepared and declared valid before being given treatment to the two classes which had been designated as research samples. The purpose of providing a questionnaire sheet on scientific attitudes towards physics is as a prerequisite for determining the sample size so that each group will then be divided into two categories, namely, high scientific attitudes towards physics and low scientific attitudes towards physics.

The researcher gave the scientific attitude questionnaire sheet towards physics in the classroom directly, then used the guided inquiry learning model in class X MIA 3 and used the discovery learning model in class minutes takes place every week for 2 meetings. The material taught in the experimental class and control class is the same, the subject matter of the material taught is: energy and effort, impulse and momentum in eight meetings.

Final Stage

The final stage of this research is the activity of giving science process skills tests with a learning duration of 3 hours (3 x 45 minutes), for classes that have been taught using the guided inquiry learning model in class X MIA 3 and the discovery learning model in class X MIA 4 which will be held on Friday and Saturday, 30 April - 1 May 2023. During the implementation of this test, there were several students who did not have time to take part in the test schedule due to other busy schedules at school. Therefore, the researcher took the participants to a test when they finished the activity. After carrying out the test, the research or data collection process has been completed, then the data that has been obtained will be analyzed according to the rules for analyzing data. The instruments in this research were analyzed as follows:

Expert Validity Test

Construct validity is closely related to the instrument's ability to measure concepts, ideas or behavior through treatment or not (Sürücü & Maslakci, 2020). To calculate expert agreement, the following equation 1 (Retnawati, 2016).

$$V = \frac{\sum s}{n(c-1)} \tag{1}$$

Keterangan:

V : rater agreement index regarding item validity

s : The score determined by each rater is minus the lowest score of the category used ($s = r - l_o$)

r : score of the rater's chosen category

l_0 : lowest score in the scoring category

n : many raters

c : the number of categories that raters can choose from

The validity of the RPP which was tested included aspects of format, content and language, each item of which was validated. Overall, the number of items in the RPP was 17, resulting in a value of V = 0.93. The LKPD consists of two aspects, namely the suitability of the content and language, with a total of 15 items, the overall value is V = 0.90. For teaching materials covering 10 aspects with a total of 29 statements, the overall results obtained were V = 0.90. For the validity of the science process skills questions, it is calculated for each question item, then the overall V value is found for the 50 questions, so that the value of V = 0.76 is obtained. And the scientific attitude questionnaire towards physics consists of 6 dimensions, a total of 50 statements, each statement is initially analyzed, then analyzed as a whole 50 statements, so that a value of V = 0.78 is obtained. Of the 5 V values obtained, all were > 0.75 so that the learning tools and questions as well as the questionnaire as a whole were declared valid.

Criterion Validity Test

Difficulty Test

The formula used to calculate the difficulty level of questions is like equation 2 (Arikunto, 2021).

$$P = \frac{B}{JS} \quad (2)$$

Information:
P: difficulty level index
B: the number of participants who answered the question correctly
JS: total number of test takers

After testing the level of difficulty on the science process skills questions that have been checked by the validator. Of the 47 questions, 3 questions were obtained in the easy category, 24 in the medium category and 20 questions in the difficult category.

Difference Power Test

The differential power for each question contained in the science process skills test is calculated using equation 3 (Arikunto, 2021).

$$D = \frac{B_A}{J_A} - \frac{B_B}{J_B} = P_A - P_B \quad (3)$$

Information:
J : number of test takers
J_A : the number of participants in the upper class group
J_B : the number of participants in the lower class group
B_A : many of the top group participants answered the questions correctly
B_B : many lower group participants answered the questions correctly
P_A : the proportion of participants in the upper group who answered correctly
P_B : proportion of lower group participants who answered correctly

Based on the calculation of differentiating power through limited trials, 47 questions were obtained. Of the 47 questions, 4 questions were in the very good category, 10 questions were in the good category, 12 questions were in the fair category and 21 questions were in the poor category.

Question Answer Pattern

Through the activity of determining the pattern of question answers, it can be seen whether the distractor is functioning well or not. The formula for calculating distractors is as shown in equation 4 (Arikunto, 2021).

$$D = \frac{A}{N} X\ 100\% \quad (4)$$

Information:
D : distractor rate (%)
A : the number of students who chose that answer
N : the total number of students who took the test

Based on the results of calculating distractor answer choices through limited trials (class X MIA 1 and class X MIA 2), 47 question numbers were obtained, with each question consisting of 5 answer choices. Overall, the number of answer choices is 235. This value is reduced by 47 because there are 47 correct answers. So the total distractors divided into 3 categories are 188. There are 6 distractors in the bad category, 21 distractors in the bad category, and 161 in the good category.

Validity test

After carrying out the trial, the next step taken by the researcher was to test the validity of the questions. The questions are in the form of multiple choices so that students' answers only have a chance of getting a score of 1 or 0 (binary), so the point biserial formula is used as seen in equation 5 (Pandey, 2020).

$$r_{pbis} = \frac{\bar{X}_p - \bar{X}_q}{S_x}\sqrt{\frac{p}{q}} \quad (5)$$

Information:
r_{pbis} : biserial correlation coefficient
$\bar{X}_p$: The average score of subjects who correctly answered the questions sought
$\bar{x}_q$: total average
S_x : standard deviation
p : the proportion of respondents who answered correctly the questions sought
q : proportion of respondents who answered the questions incorrectly (q = 1- p)

So, 33 questions were declared valid. Stating the validity of the statement items in the scientific attitude questionnaire using the product moment correlation formula with a significance level of 5%, the product moment formula 6 (Siregar, 2014).

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{\left[N\sum X^2 - (\sum X)^2\right]\left[n\sum Y^2 - (\sum Y)^2\right]}} \quad (6)$$

Information:
r : "r" product moment correlation index number
N : sample size

$\sum xy$: the sum of the multiplication results between the item score (X) and the total score (Y)
$\sum x$: item score
$\sum y$: total score

Reliability Test

All question items that have been declared valid or feasible can be tested for reliability using the Kuder and Richardson 20 technique or better known as KR-20. The KR-20 calculation formula is suitable for analyzing questions with dichotomous scores (Anselmi et al., 2019). The KR-20 formula is stated in equation 7 (Arikunto, 2021).

$$r_{ii} = \left(\frac{k}{k-1}\right)\left(\frac{V_t - \sum pq}{V_t}\right) \quad (7)$$

Information:
r_{ii} : test reliability coefficient
k : many items
pq : item score variance
V_t : total variance
p : proportion of respondents who answered "True" to the question
q : proportion of respondents who answered "False" to the question

Based on the analysis, the reliability for the students' science skills test instrument was 0.89, meaning it was reliable. Cronbach's Alpha technique was used to calculate the reliability of the instrument for students' scientific attitudes towards physics. According to Gwet in Ekolu & Quainoo (2019) the Cronbach's alpha formula can be used to calculate scores in the form of a polytomy or in the form of a Likert scale, seen in equation 8 (Siregar, 2014)

$$r_{ii} = \left[\frac{k}{k-1}\right]\left[1 - \frac{\sum \sigma_b^2}{\sigma_t^2}\right] \quad (8)$$

Information:
r_{ii} : instrument reliability coefficient
k : number of statement items
σ_t^2 : total variance
$\sum \sigma_b^2$: number of item variants

Cronbach's alpha value is expressed as a number ranging from 0.0 to 1.0. The acceptance limit range is 0.70 to 0.90 or higher depending on the type of research (Olaniyi, 2019). Based on the results of the analysis, a reliability value of 0.89 was obtained and it was declared to have met the requirements for use in research, taking into account the validity and reliability of the instrument. Before testing the hypothesis, the prerequisites are first tested using the normality test and homogeneity test. The following are the prerequisite test results:

Normality test

The normal distribution is a continuous probability distribution primarily having a bell-shaped curve described by its mean and SD values as well as extreme values in the data set that have no impact on the mean (Mishra et al., 2019). Sample testing comes from a normally distributed population, which can be expressed using the Liliefors normality test (Abdi & Molin, 2007).

Table 3. Normality test

Class	t_{count}	t_{table}	Criteria	Category
Experiment	0.08	0.15	Ho accepted	Normal
Control	0.09	0.15	Ho accepted	Normal

In Table 3 it can be seen that the t value for the experimental class is 0.08 and the control class is 0.09, while the L table value for both classes is 0.15. Budiyono in Mulyaningsih et al. (2022) states the normality testing criteria, if L0 < Ltable then the data is declared to be normally distributed. In accordance with the test criteria for the Liliofers test, both Lo values < Ltable. Based on the test results for these two classes, it can be stated that they come from a normally distributed population.

Homogeneity Test

The homogeneity test aims to determine whether or not there is a variance between groups which states that the sample is homogeneous or not, with a predetermined level of significance (Ristontowi. et al., 2022).

Table 4. Homogeneity Test

Class	Varians	Dk	F_{count}	F_{table}	Criteria
Experiment	21.91	33	1.17	1.82	Ho accepted
Control	21.28	33			

Table 4 shows homogeneity test data in classes taught using the guided inquiry learning model and discovery learning model. From the results of data testing, it is obtained that Fcount (1.17) < Ftable (1.82), it can be decided according to the test criteria that the sample comes from a homogeneous population.

After testing the prerequisites, hypothesis testing continues. If the data is declared normal and homogeneous then hypothesis testing can use parametric tests. The hypothesis test calculation is by comparing the F_{count} value with the F_{table} value.

Result and Discussion

The following are the summary results of Table 5. Two-way ANOVA test in the study:

Table 5. Summary of 2 Way Anova Test

Sources of Variance	JK	db	RJK	F_h	F_t	Criteria
Between	679.78	1	679.779	48.15	4	H0 is rejected
Between B	222.48	1	222.485	15.76	4	H0 is rejected
AB Interaction	0.015	1	0.015	0.001	4	H0 is accepted
In	903. 53	64	14.116			
Total	1.805.53	67				

Hypothesis testing criteria are based on the F test, if $F_{count} \geq F_{table}$ then H0 is rejected, meaning it is significant. The significance level used is 0.05. H0 is rejected if the significance probability is <0.05 (Supena et al., 2021). Based on Table 5, the results of hypothesis testing are obtained:

First, grouping based on the learning model used, namely the guided inquiry learning model and the discovery learning model. Based on the analysis of variance in the first hypothesis, the value obtained Fcount = 48.151 ≥ Ftable = 4, so that H0 is rejected and H1 is accepted. This means that there are differences in the science process skills of students who are taught using the guided inquiry learning model and students who are taught using the discovery learning model for class X MIA SMA Negeri 1 Tinambung. The results of the descriptive analysis also showed that the average score of the class taught using the guided inquiry learning model was 17.18 greater than that of the class taught using the discovery learning model 13.56.

Further descriptions of students' science process skills after being taught the guided inquiry learning model and discovery learning model can be seen in Figure 1.

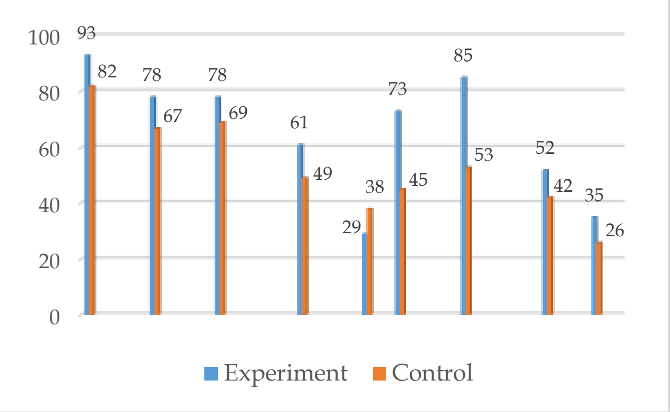

Figure 1. Students' Science Process Skills Scores

Based on Figure 1, the experimental class or taught using the guided inquiry learning model, the overall score of students is depicted in blue, while the overall score in the control class or taught using the discovery learning model is depicted in orange. In the figure you can see nine science process skills indicators which are compared between the experimental class and the control class. The science process skills indicators compared include: 1) observe, 2) classification, 3) interpretation, 4) predict, 5) communication, 6) variable identification, 7) operational definition of variables, 8) hypothesis testing, and 9) planning an experiment .

Based on Figure 1, of the 9 science process skills question indicators used, students for the experimental class on the 8 science process skills indicators were shown to get superior scores compared to students who were taught using the discovery learning model. Several data scores experienced significant differences, namely in the variable identification indicators (the score in the experimental class was 73 while in the control class it was 45) and the operational definition of variables (the score in the experimental class was 85 while the control class was 53).

This is because students in the experimental group's learning stage include activities of formulating problems, formulating hypotheses, carrying out practical work, analyzing data, and concluding. In the inquiry learning stages, educators accompany students in all activities so that the process is well directed. Meanwhile, the discovery learning model involves posing problems or asking students questions, collecting data through reading various references, processing data, and drawing conclusions that students complete independently.

The 9 indicators in science process skills will be explained: First, on the observing indicator, students who were taught using the guided inquiry model got an overall score of 93, while students who were taught using the discovery learning model got an overall score of 82. This shows that to increase students' science process skills on the observing indicator, it is more suitable to use the inquiry learning model. guided. These results are in line with research by Sakdiah & Syukri (2018) which stated that the science process skills score on the observing indicator increased after students were taught using the guided inquiry learning model compared to those taught using the experimental model. This is also in line with the research results of Solihah et al. (2016) which obtained students' post-test scores for the observing indicator in the experimental class of 4.8 while in the control class the average score was 3.5, this shows the superiority of guided inquiry.

The reason why guided inquiry is superior to discovery is because at every stage of education it accompanies students, coupled with the presentation of inquiry-based teaching materials which causes students to be able to plan what they will observe and in practical activities students directly observe things related to quantities. the quantity to be analyzed.

Classifying indicators show that the scores in classes taught by the guided inquiry learning model are superior to those in classes taught by the discovery learning model. The reason is that in the learning process educators always provide examples and explanations that make it easier for students to understand concepts and processes. This is in line with the research results of Rukmana (2018) which stated that before learning was carried out, most students were able to classify the objects provided, but were still in the weak category. After being taught to use inquiry, students are taught to observe objects so that they are able to recognize differences and similarities in objects, which results in increased classification scores. In line with the findings by Rustam. et al. (2017), the POGIL learning model simultaneously influences students' science process skills.

The third indicator is interpretation, in the data obtained the total score of students taught by the inquiry model is superior to those taught by the discovery model. In line with the data from the module effectiveness test results obtained by Dewi et al. (2017) shows that the N-gain value of students' processing skills on interpretation indicators in the experimental class is higher than in the control class. The findings by Yusra et al. (2021) obtained an increase in science process skills in students after being taught using inquiry-based modules, especially in interpretation indicators (medium category), marked by an average percentage of 60.32%.

The fourth indicator predicts. Based on Figure 1, it is known that the total score obtained by the class taught by the guided inquiry model is superior to that taught by the discovery learning model. In line with the research results of Saidaturrahmi. et al. (2019) stated that the percentage of science process skills, especially in predicting indicators, differed greatly between those taught using experiments which were superior to those taught conventionally. There are also other findings which reveal that indicators of scientific process skills predict that the experimental class is 7% superior to the control class, the experimental class is taught using the guided inquiry learning model (Fadhilla et al., 2021).

Indicators of five communication skills. This indicator is different from other indicators because the overall science process skills score of students in classes taught using the discovery learning model is higher than using the guided inquiry model. In line with findings from Astra & Wahidah (2017) by teaching students to use guided discovery, students from the first to third cycles experienced an increase in scores, especially on communication indicators. Students are fully involved in the process of discovering, understanding, processing and concluding concepts or material using science process skills, one of which is communication (Hilmi et al., 2017).

The sixth indicator is variable identification. It can be seen from figure 1 that the total score of students after being taught using the guided inquiry learning model is far superior to being taught using the discovery learning model. This is related to the research results of Ningsih & Erman (2018) where students' achievement of science process skills before being taught to use inquiry was in the very poor category, but after implementation of inquiry learning it changed to the very good category. According to Yulianti & Zhafirah (2020), using the guided inquiry learning model at the identification stage can train scientific reasoning, especially related to grouping ideas.

Indicator seven is the operational definition of the variable. According to Figure 1, the total score of the class taught by the guided inquiry learning model is higher than that taught by the discovery learning model. Likewise, the results of research by Hairuna. & Panggabean (2019) found that the total science process skills score of students taught in the experimental (inquiry) class was higher than that in the control (conventional) class, including the indicators of formulating and identifying relationships between variables.

Indicator eight tests the hypothesis. It can be seen in Figure 1 that the class taught using the guided inquiry learning model has a superior score compared to the class taught using the discovery learning model. This is confirmed by the results of research by Erina & Kuswanto (2015) which states that using the INSTAD model with guided inquiry has a positive and significant influence on students' science process skills, one of which is the aspect of formulating hypotheses. The significant difference between classes taught using the inquiry learning model and those taught using the conventional model is due to the inquiry-based learning of active students and the activities of cultivating science process skills such as formulating hypotheses, this is included in the research results (Nurmayani et al., 2018).

Indicator Nine is planning an experiment. The total score of students in classes taught by the guided inquiry learning model is higher than in classes taught by the discovery learning model. This is supported by research results which state that there was an increase in students' science process skills in the second cycle, especially in the indicator of planning experiments after being taught using the guided inquiry learning model Iswatun &

Subali (2018). Apart from that, in the research results of (Istiqamah et al., 2016) found differences in physics learning outcomes which showed that the application of guided inquiry in this class had a positive influence. As well as the conclusions of the research results of Doyan et al. (2022) stated that one of the most effective learning models is improving students' science process abilities by implementing the guided inquiry learning model.

Apart from that, a review of the objectives of the inquiry learning model which emphasizes investigation so that they are required to act scientifically accompanied by educators, is different from the discovery learning model which focuses on providing opportunities for students to search for material independently. In the learning process that has been carried out, it is found that when teaching uses the guided inquiry learning model, students are actively involved in carrying out various science process skills activities such as formulating problems, proposing hypotheses, identifying variables, formulating operational definitions of variables, carrying out practicums (data acquisition), analyzing data, verify, and write conclusions based on the instructions on the LKPD.

In contrast to implementing learning using the discovery learning model, students are not asked to formulate problems from the stimulus but are asked to identify/select problems presented or asked by the teacher. Then they are not given demands to carry out practicums for several meetings but are presented with raw or incomplete data which will then be completed and concluded.

From the two guided inquiry and discovery learning models, we can clearly see how the series of processes are not significantly different, but this is what causes the average science process skill score to be higher after students are taught using the guided inquiry learning model than after students taught using the discovery learning model because: students are really directly involved in measuring or looking for relationships between variables in the material being studied, and during the learning process the entire group of students who have been divided by researchers always feel challenged to do every thing which are directed in the LKPD and students often ask to repeat the activities carried out by their group colleagues if they have missed one or more practicum activities, so they can see everything that happens in the practicum activities.

These two things indicate that students' learning motivation when given new treatment in the form of a guided inquiry learning model can increase students' learning motivation. This is in line with the views put forward by Sukma. et al. (2016) who stated that students' learning motivation was quite high due to the implementation of a new guided inquiry learning model for students. This is also supported by the results of research conducted by Sastriani & Halim (2016) in the category of high motivation students, there was an increase from 20% to 46.7% after being taught using inquiry-based CTL learning. So it can be seen that using the right learning model will have an impact on student motivation. This motivation will certainly contribute to the value of students' science process skills. Exactly here it does not mean that one learning model is not good to use in the learning process, but rather there are several reviews that are used, one of which considers suitability for the characteristics of students.

Hypothesis for the interaction between learning models and scientific attitudes towards physics. The interaction effect of the source of variance in learning models and scientific attitudes in physics on science process skills produces Fcount = 0.001 < Ftable = 4, so H0 is accepted and H1 is rejected. So it was concluded that there was no interaction between the learning model and scientific attitudes towards physics on the science process skills of class X MIA students at SMA Negeri 1 Tinambung. The results of testing this hypothesis show that the scientific attitude towards physics possessed by students does not influence the learning model on students' science process skills.

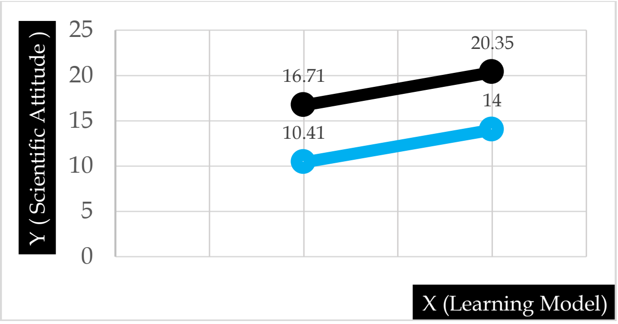

Figure 2. Interaction Patterns

Based on a summary from Tenaya (2015) regarding figures or diagrams that depict interactions between treatments, it can be seen that if two lines in a diagram are parallel, then the diagram depicts that there is no real interaction between factors. By observing Figure 2, it is known that the average science process skills score of students is always higher when taught using the guided inquiry learning model compared to being taught using the discovery learning model. The absence of interaction between learning models and scientific attitudes towards physics can be seen in Figure 2. The figure does not show any intersection points between the black and blue lines on the two lines.

In the absence of interaction in the fourth hypothesis, according to Figure 2, it is known that the guided inquiry learning model is suitable for improving the science process skills of students both in high scientific attitudes towards physics and low scientific attitudes towards physics, and is not suitable for discovery learning models either in high scientific attitude towards physics or low scientific attitude towards physics. This is in line with the results of research conducted by Salman. et al. (2017) which states that there are significant differences between students who are taught using the guided inquiry learning model and students who are taught using the conventional learning model, this is characterized by four indicators. The dominant science process skills in the experimental class is, formulating problems, formulating hypotheses, predicting results and communicating. The reasons why the two learning models used do not have an interaction effect are:

First, related to the time used in research. The research was still relatively short because it was carried out in only 8 meetings. The learning process was only carried out in 8 meetings, causing students to still be in the adjustment stage to the learning model used. The guided inquiry learning model is something that is still new for students. So the researchers concluded that the time spent in research influenced the interaction between learning models and scientific attitudes towards students' science process skills.

In this research, although the classification of students has been carried out in the two classes that are the research samples, it is necessary to know that there are individual differences (characteristics) which of course will provide different responses to the learning model applied in the class. This is reflected in the high scores of scientific attitudes towards physics among students. Not all students have high scores on the same dimension of scientific attitudes towards physics, and vice versa, whether in the experimental class or the control class. This can also be seen from the students' activities during the lesson, such as, there are students who quickly understand the LKPD instructions, they lack confidence in giving their views as evidenced by several meetings, there are several members of other groups trying to ask questions about the practicum results obtained by other groups, there are several participants students who do not give space to friends in expressing and practicing data collection activities and learning motivation.

This is in line with the essence of the view put forward by Syah (2017) which states that for psychological review there are many factors that influence learning acquisition or student learning outcomes. Factors that are considered to have a significant influence on student learning outcomes include the level of intelligence of students and motivation of students. This is also supported by a summary of research results by Hermana et al. (2022) who concluded that there was an increase in scores for all indicators of students' science process skills after being taught using virtual-based practicum learning, initially the science process skills score was in the poor category, after being taught using virtual practicum learning it was in the medium category. Meanwhile, students' learning motivation can be increased through training and habituation of students so as to improve learning outcomes.

Apart from that, there are also views that support the diversity of students in the classroom. This view is summarized from Zarwinda et al. (2015) which stated that in the 3 schools in Banda Aceh studied there were 3 types of learning styles possessed by students, where in this learning students were found who had a kinesthetic learning style who obtained a high average science process skills score after learning using the module. Similar to the view of Kosim et al. (2017) who stated that the different learning styles of students indicate the fastest and best way for each student to absorb information, generally divided into three groups.

Conclusion

Based on the results of data analysis and the previous discussion, a conclusion was obtained in this research, namely: overall, there are differences in science process skills between students who were taught using the guided inquiry learning model and students who were taught the discovery learning model for class X MIA SMA Negeri 1 Tinambung. And there is no interaction between the learning model and scientific attitudes in physics on the science process skills of class X MIA students at SMA Negeri 1 Tinambung.

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Author Contributions

Hasmawati conceptualized research ideas, research methods, analyzing data, funding acquisition, investigation process, writing original draft, visualization, management, and coordinating responsibility for the research activity. Muhammad Sidin Ali and Muhammad Arsyad guided the writing of the review and editing, supervision and validation of the instruments used in the research.

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