

THE EFFECT OF GUIDED INQUIRY METHOD ON SCIENCE PROCESS SKILLS VIEWED FROM THE LEARNING STYLES

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Abstract. This quasi-experimental study aims to determine the effect of the guided inquiry method on science process skills in terms of students' learning styles. The population of this study was all fifth grade students at SDN Leuwiliang 04, Bogor Regency, even semester of the 2021/2022 academic year as many as 68 people. When the research was carried out in June 2022 for 4 face-to-face meetings. The statistical test used is in the form of a 2x2 ANOVA inferential test. The results showed that the $F_{(count)}$ price was $29.044 > F_{table}(1:59)$ price was 4.00 and the $sig. = 0.00 < 0.05$, so there are differences in science processing skills between students with introverted and extroverted learning styles. The second hypothesis shows that the $F_{(count)}$ price is $1.859 < F_{table}(1:59)$ price is 4.00 and the $sig. = 0.00 < 0.05$, there is a difference in the science processing skills of the group of students who were treated with conventional methods and guided inquiry. In the third hypothesis, it shows that the price of $F_{(count)}$ is $205.915 > F_{table}(1:59)$ price is 4.00 and the $sig. = 0.178 > 0.05$, so there is no significant interaction between learning styles and learning methods on science process skills. There are differences in the learning styles of introvert students using the guided inquiry method towards science process skills and there are differences in the learning styles of extrovert students using the guided inquiry method towards science process skills.

Keywords: guided inquiry method. science process skills, learning styles of elementary school students

I. INTRODUCTION

elementary schools by incorporating these subjects into a school's curriculum. Usman Samatowa [1] states that science trains children to think critically and objectively. Decisive reasoning is an undeniable level reasoning interaction, on the grounds that while deciding or reaching inferences utilizing dynamic control, to be specific sensible, intelligent, capable, and capable reasoning[2]. Science is not only in the form of rote subjects, but Science teaches experiments that children can do themselves. So that this subject has educational values, namely having the potential to shape the child's personality as a whole. The 2018 PISA test results for Indonesia are still low. The reading ability of Indonesian students is at a score of 371 below the average reading score of 487. In mathematics, Indonesia has an average score of 379 which is still far below the average of 489 and Indonesia's science score of 396 is still below the average science score of 489. This condition has not changed since Indonesia's participation in PISA since 2000 as shown in the following figure:

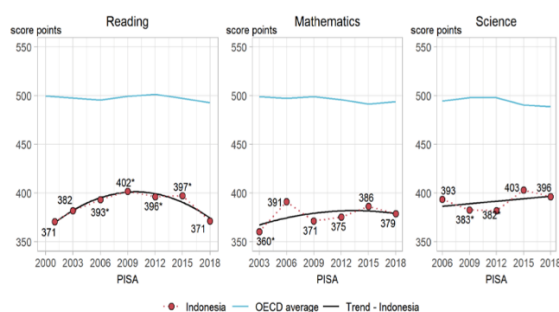


Figure 1. Indonesia's PISA scores and OECD averages

Based on Figure 1, Indonesia's PISA score has not changed. The PISA test was conducted to measure the abilities of 15 year old children in reading, math and science. The results of this test are used as a benchmark in making education policies in several countries, including Indonesia. At the practical level of learning, the 2018 PISA results can illustrate that the learning process that has been going on so far in Indonesia has not been able to boost students' abilities both in terms of reading, math and science skills. This can provide a hypothesis about the need to understand student characteristics and choose the right student learning model/method according to the characteristics of the students they have. One of the characteristics of students that can be observed is the learning style. Each student has their own learning style that makes them feel comfortable and able to absorb the learning provided by the teacher.

The results of observations and the results of interviews that have been conducted with teachers at SD Negeri Leuwiliang 04, Leuwiliang District, Bogor Regency, science process skills carried out by teachers are still very rarely implemented due to time constraints and material and very dense curriculum demands. So that the process skills acquired and learned by students are still low. The learning process has not been optimal due to the prolonged Covid-19 pandemic, and the lack of practicum or experiments to reinforce the concepts being studied is one of the reasons. Other information The base fulfillment measures for science subjects is 75 and as numerous as 60% of understudies have not arrived at the base culmination models. The completeness of students' competency achievement regarding several science concepts is also still not optimal, there are still many students who experience difficulties in completing and understanding science concepts. Less optimal learning

outcomes obtained by students can be made possible from various internal factors and external factors.

One of the elements that impact learning conditions that are as yet regular and don't contact the domain of the components of understudies is the manner by which the genuine growing experience is so that as of recently it is as yet overwhelmed by instructors and doesn't give admittance to understudies to foster autonomously through disclosure and perspectives. The conventional method in the form of lectures is always used because the teacher considers it very easy to do and easy to prepare. In lectures the teacher can use aids/props such as pictures, maps, objects, imitation items and others. Djamrah [3] states that passive students are not motivated in the learning process so that students do not understand the material being taught. Learning activities using the lecture method for the most part are very practical to use. Syaiful Sagala [4] explains that the lecture method is an oral narrative from the teacher to students, lectures are also an activity of providing information with words that are often obscure and sometimes misinterpreted. Science learning in elementary schools still uses direct learning which is always dominated by teachers using conventional methods in the form of lectures and tends to position students as listeners and note takers which causes students to become less active. Conventional learning also has a verbalistic pattern with a monotonous process [5]. One of the innovations carried out is by using a variety of learning methods that can provide opportunities for students to be active in the learning process. The learning methods applied by many teachers allow students to learn the process, not learn the product. The guided inquiry learning model is a learning model that refers to investigative activities and explains the relationship between objects and events. This form of guided inquiry learning motivates students to investigate existing problems by using scientific skills in order to find explanations. Faturrohman and Sutikno [6] state, the inquiry learning approach is motivated by the assumption of an educator that students are subjects and objects who already have knowledge. In this approach the teacher acts as a supervisor, facilitator, mediator and commentator. In guided inquiry learning it places more emphasis on student collaboration to solve problems in groups in building their knowledge and helping students to be more independent and responsible. Lusidawaty [7] on the results of her research stated that there was an increase in science process skills and students' motivation to learn science by using inquiry learning strategies

Mukhlas & Samani [8] stated that the type of learning or student learning style based on a number of studies has proven to be important for teachers to know. Woolever and Scott [9], Dunn, Beaudry and Klavas [10] found as a result of their research how important it is for teachers to integrate their teaching styles with students' learning styles. Each student has his own learning style, likened to a signature that is unique to himself [11]. The results of Sukmawati's research, learning styles are related to science learning outcomes [12]. Knowledge of each student's learning style, the teacher will be able to organize the class in such a way as a response to the needs of each individual student. Each teacher must knowing

the learning style of each student whose goal is that students are happy when doing learning activities.

There are characteristics of students in one class who have a subjective personality, in other words introverts, they usually have a tendency to like quiet, like to be alone, and are reflective about what they do. Introverted students can carry out their own activities without the help of others so that it will be easier for them to concentrate when solving problems. A teacher must be able to make students who have introverted traits feel comfortable in learning and guide them to develop in a positive direction. In addition to students having introverted personalities, there are also students who have extroverted personalities who are usually quite enthusiastic about new things and like to socialize. For extrovert students, social activities and interacting with other people are fun activities. Doing activities alone is boring. If the teacher sees students who are always excited when playing, gather with many people and have a tendency to dominate the conversation, it can be said that these students have extroverted personalities. Differences in the personality of these students will not be an obstacle for a teacher through the learning style that will be applied when presenting learning material in class. Thus a teacher must really know the personality of his students so that the learning objectives and material will be conveyed to get maximum results. The teacher's task is to determine the right method by presenting process skills that attract students' attention with learning styles that students like and are interested in so that the learning presented by the teacher is challenging and makes students enthusiastic when participating in teaching and learning activities.

II. RESEARCH METHOD

This research uses a quantitative approach in the form of a 2x2 Quasi experimental research factorial which aims to determine the effect of the guided inquiry method on science process skills in terms of students' learning styles. More in this research to find out the differences between groups of students who study using the guided inquiry method and groups of students who study using conventional methods. In this study, the exploratory gathering utilized the directed request learning technique and for the benchmark group the learning was completed involving ordinary strategies as talks. The researcher used a test instrument as a comparison and the use of the guided inquiry method was carried out in 4 meetings for each group.

The populace in this review were all 5th grade understudies at SDN Leuwiliang 04 in Leuwiliang Locale, Bogor Rule, which comprised of 64 individuals. Sampling technique with cluster random sampling. As a sample of 68 grade V students, the researcher used a saturated sample in taking samples, namely class V.A, which consisted of 32 students consisting of 14 boys and 18 girls as the experimental class which was given the guided inquiry method, while class V.B consisted of 32 students. consisting of 18 males and 14 females as a control class that was given conventional methods. Both of these methods have groups of extroverted

and introverted student learning styles. Thus there are four groups of students as research, namely: 1) student groups of introverted type students who receive treatment with conventional methods; 2) the group of students with the extrovert type of learning style who received treatment with conventional methods; 3) groups of students with introverted types of students who are treated with the inquiry method; 4) the group of students with the extrovert type of student learning style who received treatment with the inquiry method. Determination of learning style groups is based on consideration of student learning styles that have a tendency towards one of the poles, namely the extrovert type of student learning style or the introvert type of student learning style. The grouping of the research sample can be seen in Table 1

Table 1. Grouping of Research Samples

Learning Style (A)	Learning Method (B)		Total
	Guided Inquiry (B ₂)	Conventional (B ₁)	
Introvert type student learning style (A ₁)	A ₁ B ₁	A ₁ B ₂	48
Extrovert type student learning style (A ₂)	A ₂ B ₁	A ₂ B ₂	15
Total	31	32	63

III. RESULTS AND DISCUSSION

The science process skills of students taught conventionally and by inquiry in the introverted and extroverted learning style groups are analyzed descriptively in the following table:

Table 2. Descriptive Analysis

Dependent Variable: Skill Process IPA				
Learning Style	Method	Mean	Std. Deviation	N
Introvert	Conventional	77,00	3,230	24
	Guided Inquiry	92,13	3,493	24
	Total	84,56	8,336	48
Extrovert	Conventional	83,50	1,414	8
	Guided Inquiry	96,00	3,830	7
	Total	89,33	6,997	15
Total	Conventional	78,63	4,046	32
	Guided Inquiry	93,00	3,873	31
	Total	85,70	8,242	63

Source: output SPSS 20

Data Analysis Prerequisite Testing

Test the requirements of the data analyzed using two-way ANOVA are: (1) the distribution of data is normally distributed; (2) the data to be compared has the same (homogeneity) variance. [13]

1. Data Normality Test

The comparative analysis used in this study requires that the variable data must be normally distributed or close to normal. The normality test was carried out using the one-sample Kolmogorov-Smirnov test technique, namely the difference test between the data tested for normality and standard normal data. The data normality test hypothesis is:

H₀ : the data comes from a normally distributed population

H₁ : data comes from populations that are not normally distributed

Test criteria for the Kolmogorov-Smirnov test using SPSS series 20, accept the null hypothesis (H₀), if the p-value < 0.05, then the null hypothesis (H₀) is rejected at $\alpha = 0.05$ (Kadir, 2015). The results of the normality test calculations are presented in the following table:

Table 3. Calculation results of the normality test

	Tests of Normality					
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Standardized Residual for Learning outcomes	,103	63	,092	,983	63	,531

a. Lilliefors Significance Correction

Source: Results of Research Analysis (2022)

If the sig. > 0.05, then the standard residual value is normal. From the table results on the Kolmogorov Smirnov test, the sig. = 0.092 > 0.05, then it is stated to be normally distributed. In the test using Shapiro-Wilk, the value of sig. = 0.531 > 0.05, based on table 3, it can be concluded that all data on students' natural science processing skills in this study came from a normally distributed population. Thus the technique of parametric comparative analysis can be used to test hypotheses about differences between variables.

2. Data Homogeneity Test

The data homogeneity test was carried out using SPSS series 20 by looking at the Levene's test table, for the homogeneity test of two sample groups (between A) and for the homogeneity test of two sample groups (between B) and 4 sample groups (A₁B₁, A₁B₂, A₂B₁, A₂B₂) (Sudjana, [13]). The test criterion is to accept H₀ if the value, Sig > 0.05, and vice versa, reject H₀ if the p-value ≤ 0.05. [14]

Table 4. Homogeneity Test

Levene's Test of Equality of Error Variances ^a				
Dependent Variable: Skill Proses IPA				
F	df1	df2	Sig.	
2,007	3	59	,123	

Based on table 4, the value of Sig = 0.123 > 0.05 means that the sample data comes from a homogeneous population.

3. Research Hypothesis Testing

At the stage of testing the hypothesis, a description of the data is required for each treatment group. This data is useful for performing analysis of variance. Testing the hypothesis of this study used a two-way analysis of variance with the main effect of the independent variables, namely learning methods and styles. In addition, testing the hypothesis is also related to testing the interaction (interaction effect), namely whether there is interaction between learning methods and learning styles on science process skills. The analysis technique used in testing the hypothesis of this study is the 2x2 factorial which is used to test the hypothesis which says the mean difference between the sample groups. The criteria for testing the average effect are as follows:

H₀ : F_{count} < F_{table} | (no effect or difference)
 H₁ : F_{count} > F_{table} | (there is influence or difference)

The criteria for testing the effect of interaction are as follows:

$$H_0 : F_{(AB)} < F_{table} \quad (\text{no effect or difference})$$

$$H_1 : F_{(AB)} > F_{table} \quad (\text{there is influence or difference})$$

The procedure for testing the hypothesis in this study used two way ANOVA with the same cells. The results of the calculations performed are presented in the following table:

Table 5. Summary of the results of hypothesis testing with ANOVA

Tests of Between-Subjects Effects						
Dependent Variable: Skill Process IPA						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3588,645 ^a	3	1196,215	113,353	,000	,852
Intercept	346078,265	1	346078,265	32794,407	,000	,998
Learning Style	306,502	1	306,502	29,044	,000	,330
Method	2173,011	1	2173,011	205,915	,000	,777
Learning Style * Method	19,621	1	19,621	1,859	,178	,031
Error	622,625	59	10,553			
Total	466897,000	63				
Corrected Total	4211,270	62				

a. R Squared = ,852 (Adjusted R Squared = ,845)

In the Corrected model row which shows the effect of all independent variables (learning styles, methods and interaction of learning styles and methods) together on the dependent variable (science process skills) has a sig value of 0.000 < 0.05 = significant, meaning that the model used in this research is valid. Based on table 5, in the Intercept row which shows the value of the change in the dependent variable without the need to be influenced by the existence of the independent variable, the value can be changed, the sig value is obtained. = 0.000 < 0.05 means significant intercept. The R squared value = 0.852, which means that it is close to 1, which means that the correlation between variables is classified as strong.

The results of the two-way analysis of variance can be explained as follows:

Differences in science process skills between groups of students who have introverted and extroverted learning styles.

The hypothesis tested:

$$H_0 : \mu_{A1} \leq \mu_{A2}$$

$$H_1 : \mu_{A1} > \mu_{A2}$$

The results of ANOVA calculations (table 5) on the source of learning style variance show that the value of F_{count} is 29.044 > the price of $F_{table(1:59)}$ is 4.00 and the sig. = 0.000 < 0.05 then the null hypothesis is rejected or there are differences in science processing skills between students with introverted learning styles and extraverted learning styles. Furthermore, the acquisition of the average value of science learning outcomes for students with an introvert learning style $\bar{Y}_{A1}=84.56$, and a group of students taught with an extrovert learning style $\bar{Y}_{A2}=89.33$, shows that the learning outcomes of the group with an extrovert learning style are greater than student learning outcomes with an introverted learning style, meaning that learning styles are proven to have a more effective influence on students' natural science process skills

by 33%. So it can be concluded that the science process skills of students with an extroverted learning style are better than students with an introverted learning style. This is also in accordance with the research of Ilfa Irawati, Mohammad Liwa Ilhamdi, Nasruddin [15]in class IV SDN 9 Mataram with the title The Influence of Learning Styles on Science Learning Outcomes. The results of this study indicate that there is a significant influence of learning styles on learning outcomes in science class IV SDN 9 Mataram. Learning styles contribute to learning outcomes by 21.2%. Another study that supports the research results is about the effect of the group learning model on student learning outcomes in Social Studies subject in terms of the learning styles of Class IV students with the theme My Hero in 32 Elementary School Students in Tambora District by Tri Lisnawati et all [16]. Research entitled The Viability of Gathering Learning Models and Issue Put together Learning in Sociologies with respect to Understudy Learning Results In view of Learning Styles of Grade School Understudies reasons that there are contrasts in friendly examinations learning results for understudies who have a thoughtful learning style given a learning model.

Differences in science process skills between groups of students treated with conventional methods and guided inquiry.

The hypothesis tested:

$$H_0 : \mu_{B1} \leq \mu_{B2}$$

$$H_1 : \mu_{B1} > \mu_{B2}$$

The results of ANOVA calculations (table 5) on the source of the method variance show that the F_{count} price is 1.859 < the $F_{table(1:59)}$ price is 4.00 and the sig. = 0.000 < 0.05, then the null hypothesis is rejected or there is a difference in the science processing skills of the group of students who were treated with conventional methods and guided inquiry. Furthermore, the acquisition of the average value of the science process skills of the group of students who were treated with the conventional method $\bar{Y}_{B1}=76.83$, and the group of students who were treated with the guided inquiry method $\bar{Y}_{B2}=93.00$, shows that the learning outcomes of the group of students who were treated with the inquiry method guided learning outcomes are greater than the learning outcomes of groups of students who are treated with conventional methods, meaning that learning methods are proven to provide a more effective influence on students' natural science processing skills by 77.7%. So it can be concluded that the science process skills of the group of students who were treated with the guided inquiry method were better than the group of students who were treated with conventional methods. The same results were also shown in a study by Maria A. F. Mbari, Marianus Yufrialis, Theresia Nona [17]. The study entitled The Effect of Using Inquiry Learning Methods on Learning Outcomes and Student Motivation was conducted on 39 fifth grade students at SDK Nita I. There were 20 VA class students as the experimental class and 19 V B class students as the control class.

The results of this study indicate that the application of the inquiry learning method has a positive and significant effect on student learning outcomes. The group of students who took part in learning using the inquiry learning method obtained a better post-test score of 76.25 compared to the group of students who took part in conventional learning which obtained an average post-test score of 65.26.

Interaction of learning styles with learning methods on science process skills.

The hypothesis tested:

- H_0 : Interaction A x B = 0
- H_1 : Interaction A x B \neq 0

The results of ANOVA calculations on the source of learning style variance*method show that the value of F_{count} is 205.915 > the price of $F_{table(1:59)}$ is 4.00 and the sig. = 0.178 > 0.05 then the null hypothesis is accepted or there is no significant interaction between learning styles and learning methods on science process skills. The effect of the interaction between learning styles and learning methods on science process skills is quite small at 3.1%. This is also confirmed in the results of the output plots of the interaction between learning styles and learning methods as follows:

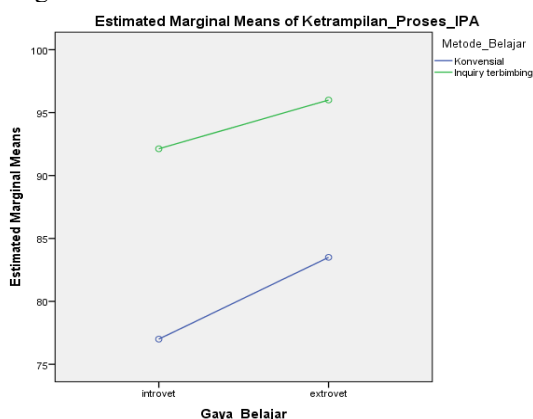


Figure 3. plots of interaction of learning styles (Gaya Belajar) and learning methods (metode belajar) In Figure 3, it can be seen that there is no intersection between the plots of learning styles and learning methods, this figure confirms that there is no interaction between the two independent variables, namely learning styles (X1) and learning methods (X2) in science process skills.

Sudaryono [18] in his book statistics for inferential states that simple effect analysis is a further test of the interaction effect hypothesis. If the effect of interaction is not significantly tested, then the simple effect cannot be continued. There is no significant interaction between learning styles and learning methods on science learning outcomes so it cannot be tested on simple effects on each group that is formed. The results of this study are in accordance with Sugeng Nugroho's dissertation [19] entitled Science Learning Using Guided Inquiry Methods Using Real and Virtual Laboratories in terms of Memory Ability and Student Learning Styles. This research used a quasi-

experimental method on 2 classes of students in class VIII of SMP Negeri Maospati in the 2011/2012 academic year. From the results of data processing in the sixth hypothesis test, it was concluded that there was no significant interaction between memory skills and learning styles on students' cognitive and affective learning achievements. The results of the seventh hypothesis test concluded that there was no significant interaction between real and virtual laboratories, memory skills, and learning styles on students' cognitive and affective achievements. Another study that is relevant to the results has been carried out by Dafid Slamet Setiana [20]entitled Comparison of the Application of CTL and Open-Ended Learning Methods by Paying Attention to Learning Styles in View of Mathematics Learning Achievement. This study was conducted at Donorojo 2 Public Middle School, Pacitan Regency in class IX semester 2 of the 2012/2013 academic year. The sample consisted of two classes from the population, namely class IXB as the CTL group with a total of 29 students and class IXC as the Open-Ended group with a total of 29 students. The results of the study showed that there was no interaction between the use of learning methods and students' learning styles on mathematics learning achievement in the opportunity material.

There are differences in the learning styles of introverted students with the guided inquiry method towards science process skills.

The hypothesis tested:

- H_0 : $\mu_{A1B2} \leq \mu_{A1B1}$
- H_1 : $\mu_{A1B2} > \mu_{A1B1}$

The results of the third hypothesis test showed that there was no interaction between the two variables, so further tests could not be carried out. However, to see differences in the learning styles of introverted students using the guided inquiry method on science process skills when compared to conventional methods can be seen from the following SPSS output results:

Table 6. Learning Style*Method

Dependent Variable: Learning Outcomes					
Learning_Style	Method	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Introvert	Conventional	77,000	,663	75,673	78,327
	Guided Inquiry	92,125	,663	90,798	93,452
	Conventional	83,500	1,149	81,202	85,798
extrovert	Guided Inquiry	96,000	1,228	93,543	98,457

From table 6, it is obtained that the average introvert learning style = 92.125 is more than the average introvert learning style using conventional methods = 77,000, so H_0 is rejected so that it can be concluded that there are differences in the learning styles of introverted students using the guided inquiry method on science process skills. The results of the research are in accordance with Cynthia's thesis, Gapila [21]entitled Smart Learning Method on Ability to Understand Mathematical Concepts in terms of Personality Type that there is no influence of student personality type on the ability to understand participants' mathematical concepts teach material algebraic forms. There is no interaction between the treatments of the SMART learning method.

There are differences in the learning styles of extroverted students with conventional methods towards science process skills.

The results of the third hypothesis test showed no interaction between the two variables, so further tests could not be carried out. However, to see differences in the learning styles of extroverted students using the guided inquiry method on science process skills when compared to conventional methods, it can be seen from the SPSS output results in table 6, the average extroverted learning style = 96.00 is obtained, more than the average extroverted learning style with conventional methods = 83.50 then H_0 is rejected so it can be concluded that there are differences in the learning styles of extroverted students using the guided inquiry method on science process skills. These results are also relevant to the study of Rawa et al [22] that there are significant differences in mathematics learning outcomes between students who take part in learning using the Inquiry Learning model and groups of students using the direct learning model which also considers the learning styles of introverts and extroverts. Thus it can be concluded that the Inquiry Learning model has an effect on the learning outcomes of mathematics in class IV students of SDI Malanuzza, Golewa District, Ngada Regency, in the 2017/2018 academic year. The results of the study are reinforced by research findings [23] that learning will produce goals if teachers have creativity and innovation in learning both in general and special schools.

IV. CONCLUSIONS

In light of the consequences of the examination portrayed already, the accompanying ends can be gotten: 1) There is a distinction in the capacity to comprehend science process abilities between understudies who study utilizing the directed request strategy is higher than understudies who study involving regular techniques as far as understudy learning styles; 2) There are contrasts in understudy learning styles between understudies who study with the directed request strategy which is higher than understudies who learn with regular techniques towards science process abilities; 3) There is no huge collaboration impact on understudies' capacity to comprehend science ideas utilizing the directed request technique on science process abilities as far as understudies' mastering styles; 4) There are contrasts in the learning styles of outgoing person understudies higher than loner understudies utilizing the directed request technique on science process abilities; 5) There are contrasts in the learning styles of outgoing person understudies higher than loner understudies utilizing traditional strategies on science process abilities.

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