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The Influence of Instructional Strategy and Motivation the Natural Science Subject Instructional Outcomes

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Abstract

Lecture instructional is the instruction in which students are asked to listen to the subject materials to be adequately absorbed. Meanwhile, discussion instructional is where students are invited to discuss the subject materials delivered to be adequately understood. The objectives of this study are to test: (1) the difference in instructional outcomes of Natural Science subject given by lecture instructional and discussion instructional, (2) the difference in instructional outcomes of Natural Science subject given by lecture instructional and discussion instructional to students who are highly motivated to learn, (3) the difference in instructional outcomes of Natural Science subject given by lecture instructional and discussion instructional to students who are low motivated to learn, (4) the influence of the interaction between instructional strategy and learning motivation on the instructional outcomes of Natural Science subject. A quasi-experimental design with a 2 x 2 factorial design. The instructional material in the experiment is a Natural Science problem for grade 11, with a sample of 80 students who already have adequate initial knowledge. Two-way analysis of variance and Tukey's test were used to test data analysis. The research results point out that the interaction between instructional strategy and learning motivation influenced the instructional outcomes of Natural Science subjects. The lecture instructional strategy is better used in groups of students with high learning motivation, and the discussion instructional strategy is better used in groups of students with low learning motivation.

Keywords: Instructional, Instructional Strategy, Lecture-Discussion, Learning Motivation,

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INTRODUCTION

In an instructional process, teachers are expected to be able to do their jobs to help students in instruction, raise students' curiosity, motivate independence, and create conditions for success in instruction. Instructional outcomes are seen as an indicator of the quality of education, and it should be considered that instructional results are part of educational outcomes (Umami, 2018). Natural Science is the primary knowledge students need to support the success of their instruction in higher education. The general objective of Natural Science education at the secondary education level is to give understanding and emphasize skills in applying Natural Science(Sangsa-ard & Thathong, 2014).

To improve the quality of education, the government has made many innovations in the learning process both at the level of primary and secondary education. Those innovations cover all aspects, including the quality of learners who study Natural Science. However, until now, these efforts have not shown results as expected. Natural Science education is not yet a primary subject of students' interest in studying seriously (Petruţa, 2015).

This indicates that the instructional results of Natural Science subjects at secondary schools are still relatively low. Particularly for Public High School (PHS) 2 Tambun Selatan Bekasi, the average score on the national exam 2017 was only 58.04. This situation is a very concerning problem for educators of Natural Science subjects, especially at the secondary education level. The low instructional outcomes can be caused by several factors, namely: (a) there are differences in students' backgrounds and instructional styles, (b) the instructional process tends to be verbal, and (c) the initial conception that has existed in students' minds in their efforts to interpret natural phenomena that they experience every day (İlic & Akbulut, 2019). The difficulty of instructional natural science subjects can be caused by the teachers' teaching style and the instructional process that is less fun than the initial conception (Mack et al., 2021). Efforts that can be made to overcome those problems include improving factors that might affect the instructional results of Natural Science, such as input and the environment (Sangsa-ard & Thathong, 2014). The input on advanced education is the output or product from the previous levels of education, whereas the environment comprises educators, facilities, and learning strategies.

The instructional result is the result of a learning implementation process and can be used as an indicator to determine the success of an instructional implementation. The measurement of the success of an instructional implementation is classified into three components: (a) effectiveness is measured from the level of student's achievement, which is prepared through (1) a thorough mastery of behavior or degree of performance fatigue, (2) a speed of performance work, (3) a level of instructional transfer, and (4) a level of retention of what is learned; (b) the instructional efficiency is usually measured by: (1) a ratio between the effectiveness and the amount of time spent by students, (2) several costs used, and (3) an instructional attractiveness is usually measured by observing the tendency of students to remain and to continue learning something related to the field being studied (Prasetyono et all., 2019). The instructional results are included in the cognitive attribute group whose response to measurement results is classified as judgment, that is, responses that can be declared true or false (Prasetyono et al. l, 2021). Instructional results in the mastery level achieved by students involving the teaching and learning programs align with the educational goals stated previously (Prasetyono et al., 2018).

Instructional results are abilities students possess after receiving instructional experiences (Lee et al., 2020). Instructional results into three domains, namely: (1) the cognitive domain that relates to intellectual instructional results consisting of six aspects, namely knowledge or memory, understanding, application, synthesis, and evaluation, (2) the affective domain that is in line with attitudes comprising of five aspects, that is, acceptance, answer or reaction, judgment, organization and internalization, and (3) the psychomotor domain that is in accordance to the instructional results of skills and the ability to act, consisting of six aspects, namely: reflex movements, basic movement abilities, perceptual abilities, harmony and accuracy, complex skills movements, and expressive and interpretive movements (Rajasulochana & Senthil Ganesh, 2019).

Instructional results are all skills and everything obtained through the teaching and instructional process at schools, which are conveyed by numbers and measured by using the instructional results test (Dong, 2020). Four references are contained in the instructional, namely: (1) a change or a new ability, (2) a change or a new ability that does not last for a moment but rather be settled and can be saved, (3) a change or a new ability that occurs because of an effort, and (4) a change or a new ability that does not only arise due to growth factors (Luyten & Bazo, 2019). Instructional takes place with the mind, so the behavior is only called learning if the learner has reached an understanding. Thus, instructional is someone's change because of experience. Instructional results will be maximal with efforts to identify factors and conditions that affect instructional results,

which can be seen from some dimensions, such as (1) learners from the instructional situation, (2) instructional process, and (3) student's activities (Wal et al. l., 2014).

Instructional strategy is a way of delivering teaching material teachers carry to their students in the classroom. According to Permendikbud No. 54/2013, quoted by Krissandi & Rusmawan (2013), it is stated that instructional targets comprise the development of the attitudes domain, knowledge, and skills that are elaborated for each education unit and is also stated that the instructional assessment as a collection and information process to measure the student's instructional achievement. In the teaching and instructional process in the classroom, the teacher monitors students and provides them guidance individually for those who have difficulty in doing assignments. Hence, if a teacher wants to succeed in teaching students, it is necessary to study the selection of learning strategies based on their characteristics and differences.

A lecture is a meeting strategy often used to arouse students' awareness and interest. Several things need to be paid attention to so that the lecture strategy can be used, namely: (1) when listening to the lecture, (2) the teacher who gives the lecture must be enthusiastic, and (3) it can motivate students to participate in instructional (Wilson et al. l, 2017). The teacher carries out a lecture by giving information to students in a room. A lecture is a teaching procedure of giving information aimed at making students ready to receive instructional learning. A lecture delivers information where the teacher speaks to give teaching material, and students listen (Velzen et al., 2012). The thing that must be considered is that the teacher must master the teaching material to be presented and is expected to be able to give humor so that participants are not bored, sleepy, and/or passive. One of the critical factors for achieving educational goals is the teaching and instructional process that will be carried out (Velzen et al., 2012).

A discussion is a medium of exchanging ideas to explain an opinion or problem-solving to a conclusion or shared understanding (PytlikZillig et al., 2011). Discussion not only adds knowledge but also affects understanding and changes in attitudes and behavior because the discussion involves a very complex thought process (Ramdayana et al., 2020). The teaching approach through discussion emphasizes three things, namely: (1) increasing students' positive attitudes toward natural science, (2) encouraging students to participate actively, and (3) exposing students to challenging skills so students can practice discussion and think analytically (Perusso & Baaken, 2020). Meanwhile, By Bee, as quoted by Rapi (2016), proposes that instruction increases when students are engaged in discussions about ideas and are involved in the process. Discussion is a cognitive behavior and natural science as objects are studied. Therefore, it can be understood that the mastery of discussion in the subject matter of Natural Science is first required to master the lower cognitive aspects, namely memory, understanding, and application.

Motivation comes from the word "motif which is the driving force that influences readiness to start doing a series of activities in a behavior (Wal et al., 2014). Motivation is related to three factors, namely: (1) what energizes the behavior, (2) what underlies the behavior, and (3) how to maintain the behavior. Moreover, it is said that these three factors provide an understanding that (a) those concepts indicate the existence of power or energy in the individual to behave appropriately in the work environment, (2) there is an allegation that the behavior is directed to a specific goal, and (3) the existence of a system that organizes and directs individuals into the work environment to be in proper form the initial goals that have been set (Fontán et al. l., 2019). Motivation is the driving force that causes someone to do something to achieve goals.

Motivation is the basis of strength or power that moves people to behave. (Huang et al., 2020), Motivation refers to the generation of forces that encourage or attract someone so that their behavior is directed towards achieving goals (Sriratanaviriyakul & El-Den, 2017). The motive is a booster used to achieve the objectives of an activity. It implies that

motive forces everything that encourages someone to act and to do something to achieve specific goals. Motive is an internal factor that inspires, directs, and integrates the person's assertive behavior to meet the needs(Kurilovas, 2020). (Sanaie et al., 2019) distinguishes two forms of motivation, which include intrinsic motivation, which does not require external stimulation because it already exists within the individual himself, that is, by needs. For example, a student who likes to read does not need anyone to order; she/he wants to find and read books as she/he wants to know the content of the book. Hence, reading and learning have become self-awareness activities with essential goals and are not just symbols. On the other hand, extrinsic motivation arises because of stimuli from outside of the individual. For instance, students learn because they know that tomorrow morning will be an exam and hope to get good scores. A student knows that if she/he gets a good score or achievement, she/he will get an award or praise from friends, teachers, and parents.

As defined by Derevenskaia (2014), Instructional is a part of the teaching and instructional process where there are a teacher and students, knowledge and skills delivered, as well as media and facilities used to convey the lesson. Instructional instruction is one of a person's growth and change forms, which is stated in a new way of behavior because of experience and practice (Aein, 2018). Instructional can add the cognitive domains: knowledge, understanding, application, analysis, synthetics, and evaluation (Foster et al., 2018). Learning motivation is supported by achieved motivation. Students with high learning motivation will only achieve high academic achievement if: (1) the fear of failure is lower than the desire to succeed, (2) the tasks in the classroom are pretty challenging, not too easy but not too difficult, thus providing an opportunity to succeed (Huang et al., 2020). Learning motivation is a value and an impetus for learning. Every born child has a learning motivation. The bigger the child, the more her/his learning motivation changes from curiosity and amazement to something that blends with his/her personality. The article of this research describes the interventions of learning carried out through lecture and discussion strategies based on learning motivation towards learning results of the Natural Science subject in Tambun-Bekasi.

METHODS

The research was conducted experimentally by using a 2X2 factorial design. The dependent variable is the instructional result of Natural Science, while the independent variable includes the instructional strategy as the treatment variable and learning motivation as the attribute variable. The factorial design of the research is presented in Table 1. This research was conducted at PHS 2 Tambun Selatan-Bekasi in 2017. The research subjects were 80 students consisting of 40 students with low learning motivation and 40 with high learning motivation. Data collection on the instructional results of Natural Science was carried out by an objective test instrument with a choice of True (T) with a score of 1 and False (F) with a score of 0.

The data were analyzed using a two-way analysis of variance (two-way ANOVA) after first fulfilling the normality and homogeneity requirements between groups of research subjects, followed by Tukey's test to identify the effect of interaction between independent variables on learning results of the Natural Science subject. Based on the Lilliefors test at the α level of 0.05, it shows that the overall group of research subjects has a normal distribution. Likewise, the homogeneity test results at the α level of 0.05 indicate that the overall group of research subjects has no different variance.

Table 1. Research design

Variable Variable*Treatment* Attribute		Instructional Strategy A Lecture A1	 Discussion A2
Learning Motivation B	High B1 Low B2	A1B1 A1B2	A2B1 A2B2
Interaction: A x B			

Description:
A1B1 = instructional groups were given lecture instructional strategies with high instructional motivation.
A2B1 = instructional groups were given discussion instructional strategies with high learning motivation.
A1B2 = instructional groups were given lecture instructional strategies with low learning motivation.
A2B2 = instructional groups were given discussion instructional strategies with low learning motivation.

RESULTS & DISCUSSION

Results

The inferential research hypothesis was tested using variance analysis (ANOVA).

Table2.Summary a*nalysis* of two-way variance

Source of Variance	DK	JK	RJK	F_h	F_t α= 0.05	F_t α=0,01
Between Column (A)	1	13,74	13,74	7,85*	3,52	2,18
Between Row (B)	1	8,65	8,65	4,291	3,52	2,18
	1	182,91	182,91	62,286**	3,52	2,18
Inside	76	475,80	6,261			
Total	79	497				

Description:
* = significant (F_h = 7,85>3,52) at α = 0,05
** = very significant (F_h = 62,286 > 2,18) atα = 0,01

a. The difference in instructional results of Natural Science subjects between students who were given lecture instructional strategies and students who were given discussion instructional strategies.

Based on the analysis of variance (ANOVA) at α = 0.05, the results obtained Fh = 7.85> Ft = 3.52. This means that H0 is rejected. So, it can be concluded that there

are differences in Natural Science instructional results between students who are given lecture instructional strategies and students who are given discussion instructional strategies.

b. There is an *interaction* between instructional strategies and learning motivation towards instructional results of Natural Science subject

Based on the analysis of variance (ANOVA) at a significant level $\alpha = 0.05$, the results obtained Fh = 62.286> Ft = 3.52 show that H0 is rejected. Thus, in conclusion, there is an interaction between instructional strategies and learning motivation regarding Natural Science instructional results. To clarify the *interaction*, a graph is presented.

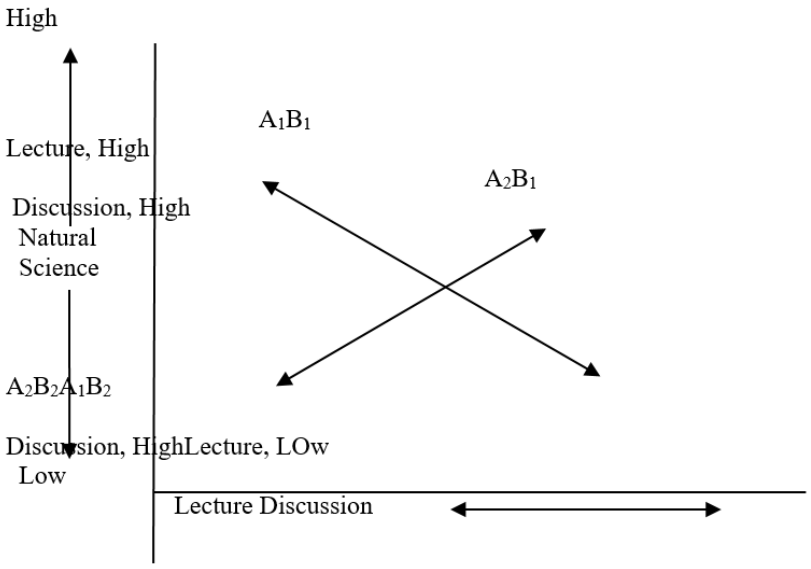

Figure 1.The *interaction* between learning strategies and learning motivation toward learning results of Natural Science

From the graph above, it can be seen that two intersecting lines connect four points. These four points are the average scores of each treatment group. With the *interaction*, the *Tukey* test was continued to see the *simple effect*, that is, to test the second and third hypotheses.

a. The difference in the instructional results of Natural Science subjects is that students who are given a lecture instructional strategy are compared with the ones who are given a discussion instructional strategy for students with high learning motivation.

The results of data analysis using the *Tukey* test identify that Natural Science learning results given by lecture instructional strategies are higher than the ones given by discussion instructional strategies, giving values of $Q_{count}$of 7.82> Q_{table}(0.05 : 4: 76) 5.74, this means that H0 is rejected. Hence, there is a difference in Natural Science instructional results for students with high learning motivation compared to those who are given lecture instructional strategies and ones who are given discussion instructional strategies.

From the average score, it can be concluded that the average score of Natural Science instructional result given by lecture instructional strategy = 18.47 is higher than the one given by discussion learning strategy = 16.87 for students with high learning motivation. Thus, group (A1B1)> group (A2B1).

b. The difference in the instructional results of Natural Science between students who are given the strategy lecture instructional strategies and the ones who are given discussion instructional strategies for students who have low motivation for learning.

The results of data analysis using the *Tukey* test, natural science instructional outcomes in students who are given discussion instructional strategies are higher than the ones who are given lecture instructional strategies, showing values of $Q_{count} = 8.19 > Q_{table}$ (0, 05: 4: 76) = 5.73, this means that H0 is rejected. Therefore, there are differences in instructional results of Natural Science subjects between students who are given discussion instructional strategies and those who are given lecture instructional strategies for students with low learning motivation.

Viewed from the average score, it can be defined that the average score of Natural Science instructional results given by discussion learning strategy = 16.00 is higher than the average score of those given lecture instructional strategy = 15, 25 for students with low learning motivation. Thus, the group (A1B2) <group (A2B2).

Discussion

1. Overall, the instructional results of Natural Science students who are treated by lecture learning strategies are higher than those of students who are treated by discussion learning strategies.

   Based on the test results, the average score of Natural Science instructional results of students given lecture instructional strategies = 32.82, higher than that of those given discussion instructional strategies = 32.87. Referring to Wijaya's opinion, instructional with lecture is a delivery of information where the teacher speaks, gives teaching material, and the students listen; students who have adequate initial knowledge when they are given a lesson with lecture pay close attention to the material being taught so that the instructional results are obtained better.

   Considering Laflamme's (2019) opinion, it is stated that in the teaching and instructional process, there are a teacher and students, knowledge and skills delivered, as well as media and facilities used in delivering the lesson. Before learning is carried out, the learning material must be adequately prepared to meet its goal. Argue that the et al. l, 2019 discussion not only adds to knowledge but can also affect understanding and changes in attitudes and behavior because the discussion involves a very complex thought process. Students who are given lessons by discussion are less active because they do not have adequate initial knowledge, so the learning results are less optimal.

2. In instructional groups with high learning motivation, the instructional results of Science Natural subjects of students who are given the lecture instructional strategies are higher than those who are given the discussion instructional strategies.

   Based on the test results, the average score of Natural Science learning results of students who were given the lecture instructional strategies = 18.47 are, higher than the average score of the ones who were given the discussion instructional strategies = 16.87. To this extent, Sriratanaviriyakul and El-Den's (2017)opinion is that achievement motivation drives learning motivation. Students with high motivation to learn will only achieve high academic achievement if their fear of failure is lower than their desire to succeed. Tasks are not too easy but not too difficult, so they provide opportunities for success. By referring to these propositions, students who have high learning motivation, if given instructional lectures, find it easier to understand the

teaching material provided by the teacher so that instructional results are more optimal.

By overviewing the words from Jansen, instructional motivation is an encouragement to do something. Every born child has a learning motivation. The bigger the child, the more her/his learning motivation will change from being curious and amazed to something that blends with her/his personality. Students who have high learning motivation are given a lesson with less attention to the discussion because they already understand what will be taught by the teacher, so learning results are less optimal.

3. Instructional groups with low learning motivation: The instructional results of students in the Natural Science subject who are treated with lecture instructional strategies are lower than those who are given a strategy of discussion instructional.

Based on the test results, the average score of Natural Science learning results of students given discussion instructional strategies = 16.00, higher than that of those given lecture instructional strategies = 15.25. In line with Hendro Prasetyono, Abdillah, and Fitria's (2018) opinion, motivation is the basis of strength or power that moves people to behave. When given lectures, students with low learning motivation are less attentive to the lessons given by the teacher because they lack adequate knowledge, so the instructional results are less good.

In line with Bybee's opinion, quoted by Rapi (2016), states that instructional results increase when students are engaged in discussions about ideas and are involved in the process. Similar to Semiawan's opinion, discussion is a means of exchanging thoughts to explain an opinion or problem-solving to a conclusion or shared understanding. Students with low learning motivation would prefer to exchange ideas about the material being discussed to obtain better instructional results.

4. There is an influence of interaction between instructional strategies and learning motivation towards the results of instructional Natural Science subject

Pointing out Rachmadtullah, Zulela, and Sumantri's (2018) proposition, it is stated that before carrying out instruction, teachers need to arrange the material to be taught so that instruction can be carried out properly according to the plan. If the teaching material is arranged well, highly motivated students would instead follow the lesson. Reflecting on Raymond's opinion, it is mentioned that students need to be motivated to take lessons to optimize learning outcomes. In the teaching and learning process in the classroom, the teacher needs to monitor students and provide individual guidance so they can be motivated to learn the lessons.

They refer back to El-Den's (2017)proposition, which states that learning motivation is supported by an achieved motivation. Students who are highly motivated to learn will only achieve high academic achievement if the fear of failure is lower than their desire to succeed and tasks are not too easy but not too tricky, so students have opportunities to be successful. Teachers should give assignments based on students' abilities so they can work on them. In Woschank and Pacher's (2020) opinion, instructional results will be maximized with efforts to identify the factors and conditions that affect instructional results. If instructional is done well, students can be motivated to follow the lesson and do the work that allows better instructional results. The overview of the influence of interaction can be seen in Figure 1.

CONCLUSION

Overall, the instructional results of students given lecture instructional strategies in Natural Science are higher than those treated by discussion instructional strategies. In the instructional groups with high learning motivation, the instructional results of the Natural Science subject of students who are given lecture instructional strategies are higher than those treated by discussion instructional strategies. In contrast, in the learning groups with low motivation, the instructional results of the Natural Science subject of students who are given discussion instructional strategies are higher than those treated by lecture instructional strategies. In addition, the interaction between instructional strategies and learning motivation influences the learning results of Natural Science subjects.

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