THE INFLUENCE OF INQUIRY LEARNING MODEL, PROBLEM-BASED LEARNING MODEL AND LEARNING STYLE TO NATURAL SCIENCE (IPA) STUDYING OUTCOMES

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Abstract
The low mastery of the concept of Natural Sciences (*Ilmu Pengetahuan Alam*/IPA) is due to the lack of critical thinking and problem solving. Inquiry learning model and problem-based learning model are learning models that can help students in the learning process. Those models will work effectively if the teacher knows the characteristics of students by understanding their learning style. There will be an increase in learning outcomes if the teacher administers the right learning model and knows the learning style of the students. This is a quasi-experiment research which aims to (1) know the difference of natural science (IPA) learning result of the students by comparing the use of inquiry learning model with problem-based learning model, (2) know the difference of science learning result by comparing the students who use visual learning style, auditory learning style and kinesthetic learning style, and (3) examine the interaction between learning model with learning style to IPA learning outcomes. The population of this study is the students of junior high school grade 7, with cluster sampling technique. The research instrument is tested for validity and reliability. Data analysis was administered by Anova 2-lane test using SPSS version 22. Before analyzed, the normality and homogeneity test of variance were tested. The result of research with significance level 0.05 indicates that (1) there was a difference in student's learning result using inquiry method with PBL model. Students who apply the PBL model obtain higher results, (2) there was no difference in student learning outcomes using visual, auditory and kinesthetic learning styles, and (3) there was no interaction between the learning model and the learning style on the students' IPA learning outcomes.

Key words: *inquiry model, problem-based learning model, learning styles, learning outcomes, natural science*

1. INTRODUCTION

Education is an individual learning process that lasts throughout life. According to the National Education System Act No. 20 of 2003 affirms that "Education is a conscious and planned efforts to create an atmosphere of studying and learning process so that learners actively develop their potential to have spiritual religious strength, self-control, personality, intelligence, noble character, and skill" [1]. The Scientific Approach to learning can be accomplished when using the applicable learning model. Lack of teacher attention to the students' characteristics, in particular learning styles affect student studying outcomes. Factors that affects the learning outcomes of science include strategies, media, characteristics of students.

The results of the observation revealed a low learning outcome in the Natural Sciences (*Imu Pengetahuan Alam*/IPA). This is due to the lack of critical thinking skills and ability in problem solving. Therefore, to surmount this problem, we need the right learning model, that is learning model of inquiry and problem-based learning model. Both learning models are beneficial in training critical thinking students on problems solving. Furthermore, learning outcomes are also affected by the student characteristics. Characteristic of this research is learning style which include visual learning style, auditory learning style and kinesthetic learning style. Assuming if we know characteristics of the students in learning style then the teacher can apply the worthwhile learning model, resulting in maximum learning outcomes.

To focus on the problem of the study above, the statement of the problem are designed as follows (1) Is there any difference of natural science learning outcome of seventh grade students between using inquiry model and problem-based learning model?, (2) Is there any difference of natural science learning result of seventh grade VII using visual learning style, auditory learning style and kinesthetic learning style?, (3) Is there an interaction between learning model and learning style to natural science studying outcomes of seventh grade students?

The objectives of this study are (1) To test whether there is difference of natural science learning result of seventh grade students between using learning model of inquiry model versus problem based learning model, (2) To test whether there is difference of natural science learning result of seventh grade students between using force visual learning, auditory learning style and kinesthetic learning style, (3) to test whether there is interaction between learning model and learning style to natural science studying outcomes of seventh grade students.

The results are expected to provide discourse/insight for teachers to find the right learning model to improve natural science studying outcomes and provide insight to teachers about the need to understand the learning style of students in the natural science studying process.

2. LITERATURE REVIEW
2.1. Inquiry Learning Model and Problem-Based Learning Model

Learning model is a conceptual framework that describes the procedures in organizing learning experiences to achieve learning objectives. [2] Inquiry is a learning model that prepares the scientific situation for students to handling their own experiments in a broad sense, want to see what happens and seek answers to a questionable problem [3]. While Hamalik suggests that inquiry is a student-centered studying strategy where students are grouped in the face of a problem or question to then seek answers to these questions through a clear group procedure and structure [3].

From the above description it is concluded that inquiry model learning is a learning involving students actively, using ability and skills to problem solving by exercised scientific method.

Table 1: Learning Steps of Inquiry model of Eggen Kauchak

Phase	Indicators	Teacher behavior
Phase 1	Presents a question or problem	Guiding students to identify problems and problems written on the board
Phase 2	Make a hypothesis	Give students opportunity to brainstorm in forming hypotheses. The teacher guides the students in determining the hypothesis that is relevant to the problem and prioritizes which hypothesis is the priority of the investigation
Phase 3	Designing an experiment	Provide an opportunity for students to determine the steps in accordance with the hypothesis that will be done. The teacher guides students to sort the experiment steps
Phase 4	Experiment for information	Guiding students to get information through experiments
Phase 5	Collect and analyze data	Provide an opportunity for each group to deliver the results of collected data processing
Phase 6	Making conclusions	Guiding students in making conclusions

Source :Nurdin (2016)

Problem-based learning is a learning model that covers students to solve a problem through the scientific method stages, so that students can learn knowledge related to the problem and have problem solving skills [5]. Scientific method is an activity step to solve problems that include observation, gathering information, making hypotheses, conducting experiments, analyzing data and making conclusions.

Table 2: Problem-Based Learning Steps

Phase	Indicators	Teacher behavior
Phase 1	Student orientation on the problem	Describes the learning objectives, explains the necessary logistics and motivates the students to engage in problem-solving activities
Phase 2	Organize students to learn	Helps students define and organize learning tasks related to the problem
Phase 3	Guiding individual / group experiences	Encourage students to gather appropriate information, conduct experiments to get explanations and problem-solving
Phase 4	Develop and present the work	Assist students in planning and preparing appropriate works such as reports and helping them for various tasks with their friends
Phase 5	Analyze and evaluate the problem-solving process	Helps students to reflect on or evaluate their investigations and the processes they use

Source: Rusman (2016)

2.2. Learning Styles

Learning styles are characteristic of a person to absorb, process and communicate information. Learning styles are the characteristics of students that influence the learning process [6]. Another opinion states that essentially everyone has visual, auditory and kinesthetic modalities, only one dominates to process information [7]. If all the modalities we use through language patterns, sounds, movements and activities will strengthen the neural network, so learning becomes easier.

Although every student basically has a visual, auditory and kinesthetic learning style, but there are often so that it becomes his trademark. Of the three learning styles, there are distinguishing characteristics. Students with visual learning styles are characterized by: (1) regular, (2) recalling with pictures, (3) requiring complete picture and purpose and (4) capturing detail. Students with auditory learning styles have characteristics: (1) speaking with rhythmic patterns, (2) learning by listening, (3) loving dialogue. While students with kinesthetic learning styles have characteristics: (1) many motions, (2) learning by doing, (3) remembering while walking and (4) learning to use physical [7]. Because of the significances we recognize the students learning style so that we more easily arrange learning strategies.

Based on the opinions of the experts above, it can be fulfilled that learning styles are characteristics or typical nature of students in learning that contains visual learning styles, auditory learning styles and kinesthetic learning styles. Learning styles are utilized during the learning activities process that making it easier to receive and process information.

2.3. Learning outcomes

Learning outcomes are all effects that can serve as an indicator of the score learning methods use under different conditions [6]. Studying outcomes stated in Permendikbud No. 104 of 2014 is the process of gathering information / evidence on the learning achievement of learners in the spiritual and social attitudes of competence, competence of knowledge and skill competencies performed in a planned and systematic way, during and after the learning process [8]. There are two factors that influence the studying outcomes are internal factors and external factors. Internal factors encompass psychological factors (such as intelligence, interests, talents, motives, characteristics) and physical health. While external factors are individual environment (family, school and community). School factors include teaching model, curriculum, media etc.

Hypothesis in this research will be explained as follows: (1) Found a difference of science studying outcomes of seventh grade student who using inquiry model learning and problem-based learning model. (2) Found a difference in science studying outcomes of seventh grade student who exercising visual learning styles, auditorial learning styles and kinesthetic learning styles. (3) Found an interaction between learning model and learning style of the science studying outcomes of the seventh grade students.

3. RESEARCH METHODS

This research is a quasi-experiment research. Its implementation was held in January to March 2018, at MTsN 1 and MTsN 2 Surabaya. Research population of seventh grade students was 440 students, with cluster sampling technique. Control class was 70 students and experiment class was 70 students. Variables used were independent variable (inquiry model learning and problem based learning model), moderator variable (visual learning style, auditory learning style and kinesthetic learning style) and dependent variable (natural science studying outcome).

Research was designed with Posttest only control group design model. This means that the final measurement results are not affected by the pretest test. The research design using 2 x 3 factorial design is shown in table 3.

Table 3: Data Analysis Plan

Independent Variable		Learning Method	
Moderator variable		Inquiry(X_1)	PBL (X_2)
Learning style	Visual (Y_1)	X_1Y_1	X_2Y_1
	Auditory (Y_2)	X_1Y_2	X_2Y_2
	Kinesthetic (Y_3)	X_1Y_3	X_3Y_3

Instruments in this study in the form of questionnaire learning style and learning result posttest. The questionnaire used is taken from Porter (2015). While the posttest of studying outcome are 25 questions on pollution material.

Prior to use for data retrieval, research instruments were tested which included validity and reliability test of learning style questionnaire. While studying outcome posttest includes the Moment Product validity test, Cronbach's Alpha reliability test, level of difficulty and different power. The analysis data by using two-path ANOVA with 5% significance level with normal and homogeneous distribution data with SPSS 22. Criteria of decision making if probability value (Sig)> r count hence Ha accepted and Ho rejected.

4. RESULTS AND DISCUSSION
4.1. The results

Research data were obtained from learning style questionnaire and posttest result from control class (inquiry model) and experiment class (problem based learning model). Based on learning style questionnaire obtained data, students who have visual learning style are 54, auditory learning style are 48 and kinesthetic learning style of 36. Whereas from posttest result had done normality test and homogeneity test before test of two-path ANOVA.

Table 4.: Normality test data

Posttest score	Statistic	Shapiro-Wilk		Conclusion
		df	Sig. (p)	
Control cohort	0.967	69	0.066	Normal
Experiment cohort	0.967	69	0.067	Normal

Table 5: Homogeneity test

Cohort	Total Student	Max score	Min score	Mean	Sd	F	Conclusion
Control	68	92	56	71.83	8.635	10.911	Homogen
Experiment	68	92	56	76.29	7.172		

Table 6: Sum of ANOVA 2x3 test

Varian source	Type III Sum of Squares	df	Mean Square	F count	Sig
Model	637.021	1	637.021	10.264	0.002
Style	334.469	2	167.234	2.695	0.071
Model style	57.802	2	28.901	0.466	0.629
Total	9.255.536	137			
R Squared= 0.115 (Adjusted R Squared = 0.081)					

Grounded on the T test yield, the average of science studying outcomes of students using inquiry model is 71.83 and problem-based learning model is 76.29.

From calculation consequence of 1sthypothesis test with significance level 0,05 obtained value of F count equal to 10.264 with probability 0.002 while F table 3.91. Because the value of F 10.264> 3.91 it can be concluded that the average learning outcomes between students who use the learning model inquiry with problem-based learning model is different. While based on probability value, assuming if the value of Sig <0.05 then Ho rejected, Ha accepted. Based on the above result Sig value 0.002 <0.05 then Ha accepted. Thus it is concluded that there is a difference in the average science studying outcomes of the students who use learning model inquiry and problem-based learning model. Students using the problem-based learning model get higher average IPA studying outcomes.

From result of calculation of hypothesis test to 1 with level of significance 0.05 obtained value of F count equal to 10.264 with probability 0,002 while F table 3.91. Because the value of F 10.264> 3.91 it can be concluded that the average learning outcomes between students who use the learning model inquiry with problem-based learning model is different. While based on probability value, assuming if the value of Sig <0,05 then Ho rejected, Ha accepted. Based on the above result Sig value 0.002 <0.05 then Ha accepted. Thus it is concluded that there is a difference in the average learning outcomes of science students who use learning model inquiri with students using problem-based learning model. Students using the problem-based learning model had higher average IPA learning outcomes.

As for the ANOVA test on the 2ndhypothesis above with a significance level of 0.05 obtained the value of F count of 2.695. With the data amount of 138 and df = 2 obtained F_{table} of 3.050. Assuming if F_{table}>F_{count} then Ho is accepted and vice versa. Based on the above data F_{count} of 2.695 < 3.060 it means Ho accepted and Ha rejected. Thus it is concluded that there is no difference in mean learning outcomes of IPA from students using visual, auditorial and kinesthetic learning styles.   Built on the research end for the 3rdhypothesis, interaction between learning model and learning style on the studying results obtained $F_{count}$of 0.466 with Sig value of 0.629, because Sig value 0.629> 0.05 then the average studying outcomes are unlike. Although R Square obtained 0.115 where less than (away) 1. It means that the correlation between the learning model and learning styles to the studying outcome of 11.5% or weaker correlation. It can be found no interaction between learning model and learning styles to students' studying outcomes. The interaction correlation between learning model and learning style to studying outcomes is shown in Table 6.

Discussion
Hypothesis 1

Based on data analysis that has been done by using T test (Independent Sample T-test) for difference test average of science studying outcomes among students who use inquiry model learning and problem-based learning model, it is concluded that there is difference of mean of science studying result of student which uses inquiry model learning and problem-based learning models. Students using the problem-based learning model get higher average sciences outcomes than inquiry model learning.

This is because the problem-based learning model is a learning that exposes the student to the problem before starting the learning process. Problem learning starts from the "problem", the problem is not only triggers learning, but also able to process learning [9]. Problem-based learning is oriented on issues with open environmental knowledge [10].

Problem-based learning is a learning approach that gives students opportunity to learn academic materials and problem-solving skills by engaging in real-life situations [2]. In problem-based learning students practice critical thinking and use the skills for problem solving and acquiring knowledge.

The upshot of this study in accordance with the theory put forward by Jean Piaget about the cognitive development stage of children. At the formal operational stage, the students can already think abstractly, identify variables and can put forward the hypothesis [4]. If the student is faced with a problem, then he will try to find the answer. Problems that can be solved are usually related to daily life. As said by Brian R. Belland [11], argumentation is a key skill that students desire. In addition, experience is urgently needed and helps develop arguing skills. Thus with application of problem-based learning model can optimize the student's potential to think critically in solving problems and practice skills in arguing.

In addition to the problem-based learning process optimizes the goals, needs, motivations that lead to a learning process. Learning Innovation can be finished by combining the use of e-learning access, interdisciplinary or integrated learning. There are three basic elements that arise during problem-based learning that initiate initial triggers/problems, examine previously identified issues and utilize knowledge in further understanding of a problem situation. [12]

Problem-based learning also has gains: (1) developing critical thinking and creative and independent skills, (2) enhancing motivation and problem-solving skills; (3) helping students transfer knowledge with new situations; (4) fostering interpersonal relationships within groups [3].

The end result also appropriate with research conducted Nurmayani [13] which declares that the score of student who applying problem-based learning model has a higher score compared than apply inquiry learning model.

Hypothesis 2

Based on the second hypothesis test, obtained the result that found no significant effect between learning styles on science studying outcomes.

Learning styles are characteristic of a person to absorb, process and communicate information. Learning styles are the student's characteristics that influence the learning process. The learning condition or the use of the method is affected by the variables: (1) the purpose and characteristics of the subject, (2) constraints and characteristics of the subject, (3) the characteristics of the learners [6].

Besides, by knowing the learning style, the teacher can determine the learning strategy so as to obtain maximum learning result. While characteristics of the IPA subject is a learning that

emphasizes on the provisions of direct learning experience through the use and development of skills processes and scientific attitudes.

The results of this study of learning styles on studying outcomes are supported by theory that basically everyone has visual, auditory and kinesthetic modalities, only one dominates to process information [7]. If all the modalities we use through language patterns, sounds, movements and activities will strengthen the neural network, so learning becomes easier.

Although each student has a visual, auditory and kinesthetic learning style, there are characteristics that distinguish all three. Visual students have the characteristics: regular, remembering with images, requires a thorough description and purpose and captures details. Auditory students have characteristics: talking in a rhythmic pattern, learning by listening, like dialogue. While kinesthetic students have characteristics: a lot of motion, learning by doing, remembering while walking and learning to use physical [7].

From the outcome of this study that students with kinesthetic learning style have average learning outcomes similar to the visual learning style in the control class as well as experimental class. The results of this study are supported by research conducted Mariono [15] which states that students with visual learning styles have better learning outcomes than students with auditory learning styles.

Students who have a kinesthetic learning style access all types of motion and emotions created and remembered, such as movement, coordination, rhythm, emotional response and physical comfort. While students who have visual learning styles access learning through vision are easy to remember, such as color, space relationships, mental portraits and images [14].

The results of this study are supported by research run by Yulianti et al (2016) express that there is no difference in learning achievement based on learning styles [16].

Hypothesis 3

Based on the result of the third hypothesis test that there is no interaction between learning model and learning style to science learning outcomes of seventh grade students. Based on the calculation using SPSS version 22 program, correlation between learning model and learning style to the studying outcome is 11.5% or the correlation is very weak. This means that no found interaction between learning model and learning style of the students' studying outcomes.

The success of a learning process is influenced by variations of teaching style, learning model and interaction between teacher and student. The principle of choosing a learning model based on the objectives, maturity and individual differences. [17] Therefore a teacher should choose a learning model that will be used in the learning activities should have many considerations, among others: the subject matter, the level of cognitive development of students and the means/infrastructure available so that the learning objectives that have been set will be achieved.

Based on the results of the research indicate that the learning model and learning style work individually to the learning outcomes, the absence of this interaction is suspected because (1) the problem-based learning model is not dependent on the learning style. (2) there is no theory that states a particular learning style gives the highest learning result.

Different student studying outcomes are also influenced by intelligence and environmental factors. Intelligence factor is a natural factor that cannot be conditioned. While environmental factors consist of family environment, school and community. Family environment factor is crucial factor and influence on student studying outcomes. The role of the family in the form of exemplary parents, giving motivation, learning facilities (books etc.). School environment also affects the studying outcomes, among others, depending on teacher competencies and also adequate facilities

and infrastructure. Community environment in the sense of easy access to gain knowledge with the help of technology. All of factors mentioned are not taken into account by researchers.

The findings research is supported by the previous research results conducted by Agustina [17] which stated that no interaction effect between learning model and learning style to studying outcome result which is shown with the Sig value of 0.174 (p> 0.05).

CONCLUSION
Based on the research results can be drawn conclusion as follow:
1. Found a difference of science studying outcomes of seventh grade between students using inquiry model learning with problem-based learning model.
2. Found no difference in the science studying outcomes of seventh grade students who using visual, auditory and kinesthetic learning styles.
3. Found no interaction between learning model with learning style to science studying outcomes of seventh grade students.

As an educator we required to appreciate the student characteristics, chiefly learning styles, so as to determine appropriate learning strategies and in accordance with the objectives of learning. In addition, we should communicate to parents about the learning styles that students have so as to encourage them to support and provide facilities to obtain optimal studying outcomes

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