

## Using SETS Approach on Cognitive Learning Achievement and Naturalist Intelligence of Elementary School Fourth Grade Students

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### Abstract

The purpose of this research was to compare the effectiveness of guided inquiry learning with SETS approach and lecturing on cognitive learning achievement and naturalist intelligence of fourth grade elementary school students. This research used quasy experimental design, pretest-posttest control group type design with guided inquiry learning SETS approach as independent variable. The dependent variable is the cognitive learning achievement and naturalist intelligence. The results of this research found that the students' cognitive learning achievement increases after being taught by using guided inquiry learning SETS approach that compare to discussion and lecturing. There is significant difference of learning achievements that apply the guided inquiry learning with SETS approach compared to the discussion and lecturing. Guided inquiry learning is more effective in improving cognitive learning achievement of fourth grade students. There is a high naturalist intelligence on the application of guided inquiry learning with SETS approach on science subject. It is suggested to teachers to apply guided inquiry learning with SETS approach in order to improve cognitive learning and naturalist intelligence. The use of guided inquiry learning with SETS approach should be priopritized in learning.

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## INTRODUCTION

Natural Science in primary schools adapted to the Ministerial Regulation No. 22 Year 2006 regarding the content standards for units of primary and secondary education which states that natural science or science is required in daily life to meet human needs through solutions to problems that can be identified.

Based on Government Regulation No. 19 of 2005 on National Education Standards Article 6, paragraph (1) stated that in the structure of the curriculum for this kind of education in primary and secondary education one of which must contain a group of subjects of Science and Technology. In Article 7 paragraph (3) stated that a group of subjects in science and technology in SD/MI/SDLB/Package A, or other equivalent form of one of them implemented through natural science.

The process of learning science in Content Standards implemented to achieve the goal of learning science, namely: (1) obtain faith in God Almighty is based on the existence, beauty and order of his creation; (2) develop knowledge and understanding of science concepts that are useful and can be applied in everyday life; (3) develop a curiosity, a positive attitude and an awareness of the relationship interplay between science, environmental technology, and society; (4) develop process skills to investigate the nature around, solve problems and make decisions; (5) raise awareness to participate in maintaining, protecting and preserving the natural environment; (6) increase awareness to appreciate nature and all its regularity as one of God's creation; and (7) acquire a stock of knowledge, concepts and skills of science as a basis for continuing education to SMP / MTs (BSNP, 2006: 485). The purpose of learning science in SBC contains concepts that can balance the affective, cognitive and psychomotor student. However, what happened in the field shows that the quality of science teaching is not getting satisfactory

results. Results of research TIMSS (*Trends International in Mathematics and Science Study*) which showed that the ability of Indonesian students in Science is ranked 22 in the rankings to eighth with a scale of the average score of 406 in which it indicates that Indonesia is under scale score average defined by TIMSS is 500. (Puskurbuk Kemdikbud Research, 2011). In addition, other findings according to Haryono (2013) IPA during this learning process, the teachers put more emphasis on a number of facts and concepts. The use of the lecture method which is not varied is often carried out in any learning activity, so the learning activity is always dominated by the teacher. Learners become passive learning, and quickly bored in learning. This is because too scarce use/utilization of tools to support science teaching. Learners are just a listener, the author of the summary or the registrar of the materials on the source book.

There are three main components of the results of applied science teaching in primary schools, which is a process, product, and scientific attitude. The three main components can be included in the three domains of learning outcomes, namely cognitive, affective, psychomotor. But in every class there are students with different abilities (intelligence, talent, speed of learning, etc.), in addition to their learning style is different. As a teacher it's good to also pay attention to learning materials and learning activities. The goal is for teachers to be able to determine carefully the materials that will be provided by using teaching procedures in accordance with the difficulties experienced by students.

One attempt to do to overcome individual differences is an appropriate approach to the difficulties students. According to Howard Gardner in Fred (2014), each individual has eight types of intelligence, such as: (1) linguistics intelligence, (2) mathematical logic, (3) spatial, (4) kinesthetic body, (5) musical, (6) interpersonal, (7) intrapersonal, (8) naturalist intelligence. These eight types of intelligence on each student's self can be used

as a reference to find the appropriate teaching strategies for teachers to measure each student's competence. Intelligence associated with the ability to recognize changes in the environment, plants, animals and other parts of the universe is the naturalist intelligence (Armstrong, 2013). The naturalist intelligence is expertise in identifying and classifying various species of flora and fauna of an individual environment which may be associated with the process of learning science in everyday life.

Science learning process is expected to improve scientific thinking skills, student activity and creativity of students is the provision to develop skills in life. To get the optimal learning takes the role of teachers in the learning process. But the fact there are many teachers who use conventional learning models so that the teacher dominated learning, such as lectures, discussions, and administration tasks. It made the students feel bored and tired so the impact on the absorption of learning materials as well as the willingness of students to learn. So that when there is a repeat of students rely on rote material and find a correct answer to a given problem. It has an impact on students' knowledge in the can instantly and easily forgotten.

Knowledge and abilities of students who obtained student is expected not only from the results of memorizing material rather than find themselves by the students. Master stimulating activity refers to any activity that find knowledge of the material being studied or proposed by the teacher. Teachers engage students in the process of data collection and testing of hypotheses. Teachers guide students to find a new understanding, skills and acquire knowledge based on their own learning experience. Activity learning is done through a process of questions and answers between teacher and student. Because of the ability of teachers to use questioning a requirement in the conduct of inquiry.

Inquiry learning model is a process for students to solve problems, plan and conduct

experiments, collecting and analyzing data and drawing conclusions. Involve students directly in the learning process so that scientists are accustomed to behave in an objective, honest, creative, and respect for others (Rustaman, 2005). The role of teachers in inquiry learning is referred to as guided inquiry learning or *Guided Inquiry*. *Guided Inquiry* is an inquiry in which the role of the teacher is still there. *Guided inquiry* can be used in the learning process where on this model the student does not slip without the supervision of teachers, but teachers still play an important role in the learning process. *Guided Inquiry* can help teachers to convey and instill understanding of the learning material that will be presented as well as providing hands-on experience to students. In other words, *Guided Inquiry* invites students to learn independently with the help of a teacher.

Science education in primary schools should be an opportunity to foster students' curiosity naturally. This will help them develop the ability to ask and seek answers to the evidence available in everyday life and to develop ways of thinking naturally. Science education is expected to become a vehicle for students to learn about themselves and the environment, as well as further development in applying it in our daily lives. The learning process emphasizes providing direct experiences to develop competency in order to explore and understand the universe around scientifically. One effort that can be done in an integrated manner to IPA is the vision of integrated science teaching SETS (Ipah, et al., 2012). After interacting with its environment, students will gain experience as a capital for learning.

*SETS* approach is intended to help students see science concept, its development and how it can affect the development of environmental science, technology, and society as a reciprocal and interrelated (Binadja, 2005). The same thing is stated Zoller (2011) that the learning of science in the context of the *Science-Technology-Environment-Society (STES)* in the Primary School were able

to develop students' skills in asking, decision making, problem solving and planting skills cognitive thinking high level and is responsible for the public and related environmental positive and negative impact of the use of science and technology.

Interview with teacher Elementary School fourth grade at Holy District in November 2016, showed the students in the implementation of science teaching fourth graders are good enough. Teachers use direct instruction method involving daily life. The teacher gives a problem related to the topics to be studied and provide the opportunity for students to ask questions. Then the teacher did debriefing to determine temporary answer (hypothesis) on the problem and prepare media and props to prove the hypothesis. But in the whole process, they found the students are passive, low curiosity, students have not been able to process the information so that only accept material from teachers and books, and a lack of student interaction with the environment. Students difficulty connecting material everyday life. This is because the students have not been able to solve the given problem and the teacher can not develop knowledge by interacting with the environment. Lessons Plan used by teachers in the academic year 2015/2016 is still a *teacher-oriented* so that students are rarely involved in the learning process. In addition to the material test results of the Environmental Change in SD 04 Tenggeles still found 75% of students who score less than minimum completeness criteria (KKM), namely 70 and SD 03 Connects found 74% of students less than the minimum completeness criteria (KKM) is 70.

Learning which can help students know the concept of science in scientific thinking and dealing with the environment, technology, and society as a reciprocal and its relation to science is through Model *Guided Inquiry* with *SETS* approach. Teachers can use the discovery learning model with the help of a teacher (*Guided Inquiry*) to achieve students' competence. With *Guided Inquiry* students can

train their scientific attitude, making simple work and connecting material with everyday experience. *SETS* approach in the discussion prioritize links between topics with students' daily lives. Students are expected to not only memorize concepts but directly apply concepts learned with the power of reason. *SETS* approach can help students in knowing the science and technology used can affect the environment and society. The second study to determine the effectiveness of the learning model never been done before. Research conducted by Susanti entitled "*Measures to Improve Learning Outcomes IPA using Guided Inquiry Learning Model Elementary Fourth Grade Students*" stated that improving student learning outcomes increased to 26 students (100%). While the research conducted by Husnul Hotimah with title "*Application of Learning Model Integrated Sciences Visionary SETS for Junior High School Students Improve Learning Outcomes*" states that envisions an integrated science teaching *SETS* improve learning outcomes and learning completeness higher in the experimental class amounted to 84.09% - 71.14% = 12.95% compared to the class control.

Based on the above description of the background research will be conducted experiments with the title "Effectiveness of Guided Inquiry Learning with *SETS* approach on Cognitive Learning Achievement and Naturalist Intelligence of Elementary School Fourth Grades".

## METHODS

The design of this study used experimental design and this study tested the effectiveness of a learning model. Shape design in this experimental study was quasi experiment (Quasi-Experimental Design) form of non equivalent control group design. The shape of this experimental design was the development of a true experimental design, which has the control group, but not able to function fully to control external variables that

affect the experiment. Form of study design *quasi-experimental* used is *nonequivalent control group design*. This design is similar to the *pretest-posttest control group design*, this design only in the experimental group or the control group was not chosen randomly. The experimental group is the group treated by implementing learning model *guided inquiry SETS* approach, while the control group was given the usual lesson the model of learning discussions and lectures. Forms of study design can be described in Table 1.

**Table 1.** Forms Designs Exhibit Quasi-Experimental Design Type Nonequivalent Control Group Design

| Kelompok     | Pretest        | Perlakuan      | Posttest       |
|--------------|----------------|----------------|----------------|
| Eksperimen A | O <sub>1</sub> | X <sub>1</sub> | O <sub>2</sub> |
| Eksperimen B | O <sub>3</sub> | X <sub>2</sub> | O <sub>4</sub> |

In this design, there are two groups: control group and the experimental group. The first group was treated (X<sub>1</sub>) and the other using the model of discussions and lectures (X<sub>2</sub>) called the group treated experimental group and the untreated group called the control group.

Before being treated, each group was analyzed using a similarity to values *pretest* (O<sub>1</sub>) the cognitive learning science material changes in the environment, this analysis is to determine the initial state of normality and homogeneity of the sample. Then the experimental group was treated using a model of *guided inquiry SETS* approach (X<sub>1</sub>), while the control group was treated by using a model of discussion and lectures (X<sub>2</sub>). Then the two groups were given the *posttest* (O<sub>2</sub>). In this

**Table 2.** Results of *Pretest* and *Posttest* Experiment Class and Class Control

| Data             | Top rated | Lowest rated | Pretest | Postets | Average | Criteria |
|------------------|-----------|--------------|---------|---------|---------|----------|
| Grade control    | 82.5      | 47.5         | 67.5    | 78.4    | 72.9    | Average  |
| Class experiment | 82.5      | 45           | 69.2    | 82.5    | 82.6    | High     |

The results of *pretest* the experimental class average value obtained. The average rating was 69.2. In the control group gained an average value is 67.5. While the results of

study, the effectiveness of the treatment model of *guided inquiry SETS* approach were analyzed by classical mastery learning, different test and test n-gain. If there is the effectiveness of the experimental group compared with the control group were given an effective means of treatment of the cognitive achievement of students.

In this study, the population was around the fourth grade students of SDN 4 Tenggeles and SDN 3 Sambung. Selection of students at SDN 4 Tenggeles and SDN 3 Connect as the study population because the population has been qualified as a homogeneous population, based on homogeneity test using SPSS 16 odd final exam replay value (UAS) 2016/2017 academic year both the elementary class has a population homogeneous.

The sample in this study was determined by using the technique of *sampling nonprobability* saturated sampling type, ie sampling technique by using all members of the population as a sample. All members of the population used as samples for its population consists of only two elementary schools. Therefore, the sample used in this study is the SDN 4 Tenggeles as an experimental class and SDN 3 Sambung as the control class.

**RESULTS AND DISCUSSION**

**Effectiveness Guided Inquiry Learning with SETS Approach to Cognitive Learning Achievement**

To know the student learning outcomes after treatment using guided inquiry learning model berpendekatan SETS can be seen in Table 2.

*posttest* the experimental class score average of 82.5. In the control group gained an average value as much as 78.4. This shows that in each

experimental group and control group increased.

Classroom experiments in this study using learning model *guided inquiry SETS* approach. Stages in learning *guided inquiry SETS* approach is an orientation, formulate hypotheses, conduct experiments, testing hypotheses, communicating the results and make conclusions. The first meeting in this lesson, students are guided to know the concept of environmental change through trials or experiments. This trial activity involving all students so that students can find their own material changes in the environment. This learning is applied so that students can actively participate in learning activities and can find their own knowledge. In addition to the experimental method, learning *guided inquiry SETS* approach using the method of discussion. The intended use of the method of discussion is for students to collaborate with other students, can express their ideas and better, become more active and improve students' courage and confidence in a positive way. In addition, students can learn to find knowledge or concept of the discussion with the students sharing. Minner and Levy (2009: 1) conduct research to investigate the results of inquiry-based teaching. The results are analyzed the findings of 138 studies showed a positive and clear support inquiry-based learning practices, especially instruction that emphasizes students' active thinking and draw conclusions from the data. Teaching strategies that actively engage students in the learning process through a standard full investigation at the time.

Each meeting to material changes in the physical environment of students conducting

experiments. In experiments using the equipment and materials provided by the teacher and is already available in schools, which is derived from the school environment in the form of plants, suave, water, stone and others. After conducting experiments performed outside the classroom, the students returned to the classroom to discuss the results of his experiments. After obtaining the results of the discussion, representatives from each group advancing to communicate the results of the discussion and the other group was given a chance to respond. By the time the teacher asks the students active in answering questions from the teacher. This is in accordance with the opinion Hamalik (2008) that guided inquiry learning model engages students in answering the questions the teacher. After the students communicate the results of the discussion, the other listened. The teacher and the students concluded that the material has been studied. After the learning process is completed, students are given a *post-test* to determine student learning outcomes after treatment. Value *pretest* was conducted to determine an initial understanding of the material environment changes made conclusion to the given treatment. The average results of *pretest* the experimental class score is 69.2.

**T-test analysis of**

Further analysis data is an analysis results *posttest* of both classes to determine the average differer ceresults of *posttest* between the experimental classes and control *classes*. Value *posttest* experimental class A and class B experiment can be seen in Table 3 below.

**Table 3.** Value *posttest* Experiment and Class Class Control

| Data            | Class | Number of students | High value | Low value | Average | Complete classical (%) |
|-----------------|-------|--------------------|------------|-----------|---------|------------------------|
| <i>posttest</i> | E     | 30                 | 82.5       | 47.5      | 72.9    | 96                     |
|                 | K     | 34                 | 82.5       | 45        | 82.6    | 96                     |

Based on the analysis of t-test showed that the data are homogeneous (sig = 0.287; p > 0.05).

This means that there is no variance between the experimental group and the control group. In

other words, the data variation in both groups was the same.

The calculation result of t-test analysis also shows that there are significant differences that apply learning guided inquiry learning with SETS approach compared with learning to apply the method of lecture and *discussion*. The calculation result of t-test analysis showed t values in the column *T-Test for Equality of Means sig. (2-tailed)*  $0.007 < 0.05$  then  $H_0$  is rejected and  $H_a$  accepted. That is, there are differences in average cognitive achievement grade students experiment with guided inquiry learning with SETS approach and control class with discussion and lecture teaching *methods*.

**Analysis Gain**

Calculation result analysis showed gains for the experimental class obtained a score of

0,436 with high category. Meanwhile, the results of the calculation of the gain for the control class analysis obtained a score of 0.302 in the medium category.

**Effectiveness Guided Inquiry Learning with SETS Approach to Naturalist Intelligence**

Peningkatan naturalistis measured through observation sheets during the learning process during the 4 meetings. Naturalist observation sheet the percentage of the total score of the indicator held divided by total number overall indicators. Naturalist observation sheet has four indicators and four criteria were excellent, good, sufficient and less. The results of the observation sheet are presented in Table 4.

**Table 4.** Analysis Naturalist Intelligence

| Observation sheet naturalist intelligence | Score | %    | Criteria  |
|---|-------|------|-----------|
| 1 <sup>st</sup> Meeting                   | 79.8  | 79.8 | Good      |
| 2 <sup>nd</sup> Meeting                   | 80.9  | 80.9 | Good      |
| 3 <sup>rd</sup> Meeting                   | 83.7  | 83.7 | Excellent |
| 4 <sup>th</sup> Meeting                   | 86.5  | 86.5 | Very Good |
| average                                   | 82.7  | 82.7 | Very Good |

The naturalist intelligence is said to meet the criteria when the score reached an average of 75%. Results naturalist intelligence score an average of 82.8% met the criteria average. So we can say naturalist intelligence contained in the experimental class using learning model *guided inquiry* SETS approach on material environmental change science subjects.

Based on the above data, it can be concluded that there are differences in learning outcomes in learning by using guided inquiry SETS approach in science learning compared to learning strategies discussions and lectures.

Improving student learning outcomes in the classroom experiment shows that the model of guided inquiry SETS approach can improve student learning outcomes in learning science in the fourth grade. This study shows learning achievement experimental class is higher than the control class. This is because students have the

opportunity and facilities to conduct his own experiments, so that learning will be more meaningful. Learning meaningful and based on the experience of students will result in long-term memory. While in the control class, students tend to be passive in learning activities. Students just accept what is presented by the teacher, so that the learning outcomes of control class lower than the experimental class learning outcomes. The results of *post-test* this in accordance with Hmelo journal, Duncan and Chinn (2007) that there are different results between the experimental class and control class on learning *inquiry* model.

In material science learning activities "Environmental Change", each student is obliged to formulate a hypothesis, then the hypothesis that has been formulated hypothesis combined with the group of their friends. These activities provide guidance to students to strive to learn together so that the knowledge gained is more

meaningful. This is in accordance with the characteristics of guided inquiry by Kuhlthau (2007) states that students learn actively and reflected on the experience. It is also delivered by Smarabawa, Aryana and Setiawan (2013) that based learning of Science, Technology and Society as one of the innovative learning that utilizes environmental issues in the learning process, it is theoretically capable of forming the individual has the ability to foster understanding of the concepts and skills berpikit creative and contextual, meaning directly linked with real life students. Similar feelings were expressed by Lestari (in Smarabawa, Aryana and Setiawan, 2013) concerning the learning of Science, Technology and Society include learning more interesting and not boring, so the students' motivation will be higher, the nature of learning will be more meaningful because students are exposed on the situation and the real situation or are natural, the material is studied more factual, learning activities students become more comprehensive and more active because it can be done in various ways, learning resources become richer so that students can understand and appreciate the aspects of life in the environment.

In this study, students acquire knowledge about environmental changes through discussions and experiments. In addition, discussions and experiments can guide students to learn and develop knowledge together. Students will not easily forget the experience that has been done so that learning becomes more meaningful. Each step in the learning process leads students to discover knowledge by themselves. This is in accordance with the opinion of Cain (1993) the nature of science as a process, means that science is a process or method to gain knowledge. This is also supported by learning theory konstruktivisme which revealed that knowledge will be more meaningful when searched and found by the students.

To determine the naturalist intelligence in learning model *guided inquirySETS* approach is by using the observation sheet. Observation sheet is given in the experimental class in learning to use learning model *guided inquirySETS* approach. Observation sheet is given at each meeting so as

to have an average value of 82.7 kesuluruhan ie meeting the criteria very well. The naturalist intelligence is said to appear when the score reached 75. So it can be proved that the learning model *guided inquirySETS* approach there high naturalistic intelligence.

The naturalist intelligence role in loving and caring nature well. The process of protecting the environment is to their interest in the environment such as an interest in animals, love for pets, find out the names/types of animals or plants, pleased with flowers, leaves and phenomena in nature and open as a venue for the exploration activities. This is in accordance with the opinion of Calik and Birgili (2013) that the naturalist has the characteristics such as learning outside the classroom, to identify animals and plants, in the realm of studying animals and natural experiment.

In the opinion of Khasanah, Dwiastuti and Nurmiyati (2016) naturalist in learning science looks at the activities of field observations, relating to the content knowledge and process skills, and connect with the material in outdoor conditions. It is the same as that carried out this study, the experimental phase, namely the activity observed phenomena and recording of data, students need naturalist whether students were able to make observations and see phenomena that exist in the natural environment.

This research is consistent with the theory that the importance of naturalistic intelligence in an effort to improve the ability of students to solve environmental problems. The naturalist intelligence Siwa significant impact on the ability of students to solve environmental problems. In this case needs an understanding in considering the student naturalist intelligence as one of the characteristics of the students. Where students with demonstrated high naturalistic intelligence skills, abilities and proficiency in identifying and classifying a variety of plants and animals in the environment. In the real world, a naturalist, who has a high intelligence to own proficiency in gardening, taking care of the beautiful plants, raise animals and have a deeper concern about saving the environment. A naturalist typically has shown his talent since childhood, which will have



a naturalist high characterized by happy raising animals can recognize and member names of many types of plants, has an interest and knowledge of how the body works, be able to read the signs of nature, such as the weather , have an understanding and interest in global environmental issues and believes that the preservation of natural resources and sustainable development is a must.

## CONCLUSION

The results of data analysis and discussion, it can be concluded that: student learning outcomes in the experimental class that implements the model *guided inquiry* SETS approach more effective than the control class that uses conventional learning models. learning model *Guided inquiry* SETS approach effectively used. It is shown that 96% (over 75%) experimental class students have met KKM. Differences in learning outcomes in the experimental class is better than the control class views of the average score obtained by each class. Furthermore, the increase in the average score of student learning outcomes in the experimental class is greater than the control class. The naturalist intelligence met the criteria when the score reached an average of 75%. Results naturalist intelligence score an average of 82.8% met the criteria average. So we can say naturalist intelligence contained in the experimental class using learning model *guided inquiry* SETS approach on material environmental change science subjects. Advice given expected to especially teachers of primary school teachers to be able to apply the learning to improve student learning outcomes and improve the intelligence of the students, in this case learning model *guided inquiry* SETS approach can be used as an alternative to existing learning range. Learning *guided inquiry* SETS approach requires precision in understanding the material so that the learning *guided inquiry* SETS approach be considered in the preparation of the material.

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