



TRENDS IN SCIENCE
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CASE STUDY OF FORMULATING STUDENT'S PROBLEM OF ISLAMIC ELEMENTARY SCHOOL TEACHER EDUCATION ON BASIC CONCEPT OF NATURAL SCIENCE SUBJECT

Nirwana Anas

Program Doktor, Universitas Negeri Medan

Corresponding author: nirwana.anas46@gmail.com

ABSTRAK

Students at all grade levels and in every domain of science should have the opportunity to use scientific inquiry and develop the ability to think and act in ways associated with inquiry, including asking questions, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments (NRC, 1996). Inquiry learning requires that students have the ability to formulating student's problem. This research is conducted to semester III on islamic elementary school teacher education, faculty of tarbiyah and teacher's training of North Sumatra following basic concept of natural science by 140 students. The aim of this research is to give a view about the ability of formulating student's problem. The type of case study reasearch is used to reveal individual data. The used method of collecting data is interview and documentation while the data analysis uses content analysis technique and comperative analysis. The result of the research shows that the ability of formulating student's problem is 54% on claim of science, 8 % on comprehension, 8 % on apication, 31% on analysis leven and no one reaches on evaluation claim and creativity.

Keyword: Formulating problem ability; Students; Basic Concept of Natural Science

INTRODUCTION

According to National Science Education Standard, inquiry instruction is a learning involving students in an activity of questioning, data analysis, and critical thinking. It is mentioned in a document that "Students at all grade levels and in every domain of science should have the opportunity to use scientific inquiry and develop the ability to think and act in ways associated with inquiry, including asking questions, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments"(NRC, 1996). In this document it is emphasized that in inquiry learning all levels obtain opportunity to practice the research to develop thinking and behavioral skills includeing asking questions, planning and conducting research, using tools and data collection techniques, critical and logic thinking about the relationship between evidence and explanation, building and analyzing explanation and communicating the argument scientifically. Inquiry is the key science and mathematical education that has been known since the time of John Dewey (1910) who said that inquiry-based learning that underlies the criticism of science learning in the class. Inquiry is a



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technique that helps students to seek and construct information through their ability with the help of the teacher's direction .

Inquiry is a pedagogical approach to help students in achieving a scientific comprehension by combining scientific knowledge with reasoning and thinking skills (Newmann, 2004). Pedaste and friends (2015) Inquiry-based learning gained popularity in science learning, international research and development projects as well as teaching.

Since Socrates age that became the father of classical philosophy until Einstein who became the greatest 20th century scientists, all consider that questioning is as the key to the success of learning. Problem formulation is one of the steps in inquiry learning. The formulation of the problem is defined as a formula that questions a phenomenon, either in its position as an independent phenomenon or in its position as one phenomenon each other, both as a cause and as a result.

It is not easy to design the right targeted questions. The thing that may happen is more difficult to design questions than answer them. The student's ability to ask is related to how students develop their own learning activities. The formulation of problems in learning inquiry has several functions, including: as a driver of a research activity to be held or in other words serves as a cause of research activities that become available and can be done; as a guide, determining the direction or focus of a study; and determining what kind of data is necessary and should be collected by students.

A formulation of problem is useful or related to the effort of the formation and development of theory, in the sense of the clear solution that is expected to be able to provide meaningful theoretical contributions, both as a creator of new theories and the development of existing theories.

Optimal learning process is characterized of the achievement of learning objectives, learning objectives will be achieved if students learn actively. Student activity can be seen with the emergence of questions and ideas based on the students' understanding and experience. Students with high learning achievement can have the ability to find ideas, something they do not know, curiosity, can work together well, willing to recognize the rights of others, understand their boundaries and obligations and have the ability to cooperate with their environment.

The ability to formulate problems can not be separated from the ability to ask questions. In the learning process, asking has a role: increasing students' participation in teaching and learning activities; arousing students' interest and curiosity about a problem that is being faced and discussed; developing the patterns and ways of active learning from the students because thinking itself is actually asking; guiding the thinking process of students because good questions will help students to determine a good answer; and focusing students' attention on the issues being discussed. According to Sumiati the benefits of asking, (2008) is to broaden the insight of thinking, without asking limited knowledge on what is received; to invite reinforcement, students will feel satisfied if the question that will be used as discussion during learning; and to provide motivation or to encourage students to learn more, it will stimulate curiosity even deeper.



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Fond of asking means active learning, but in fact, the collage students' ability to ask is low. This is presumed to be caused by several factors, including: the pattern of learning habits while still in school, students are accustomed to receive, only 1 percent of children is able to ask questions of good quality; teachers doubt the ability of the child since in the early class to explore questions; the results of the study show that the question is dominated 60% by the teacher; the teacher answers his own questions, so it does not stimulate the students to have their own questions; and when students ask, the teacher does not to try to give answers to students' questions but to ask new questions. As a result of some of these reasons, the ability to question is ultimately not honed well. This ability requires habituation and knowledge to produce good results.

Some steps considered to improve the ability in formulating this problem are: to provide quality thinking time before asking students to apply and answer the statement (comfortable science); through questions asked, students can have their own questions (self question); and from the formulation of the problem designed, the question can be answered through learning activities that will be conducted.

Through this research, it will be obtained information about the ability to formulate the problem of students of Islamic elementary school teacher education department of Faculty of Tarbiyah and Teacher's Training - State Islamic University of North Sumatra which will be the basis to see their readiness when Inquiry learning model is applied that requires that ability. If the results are found to be low, it is necessary to make improvements before the inquiry model is applied until the results are good. Furthermore, this study is also expected to contribute thoughts for scientists in order to conduct similar research to enrich the world of science.

RESEARCH METHOD

The methodology used in this research is qualitative method. Method is a process, principles and procedures used by researcher to approach a problem and seek answers. In other words, the methodology is a common approach to study research topics. A qualitative approach is a process of research and understanding based on a methodology that investigates a social phenomenon and a human problem. This research is qualitative by using a case method. Case study is one of the strategies and methods of qualitative data analysis that emphasizes on special cases that occur in the object of analysis.

The object of research that focuses on research is the target itself. The targeted research does not depend on title and topic of research, but concretely it is described in the research problem formulation while the research informants are subjects who understand the information object of research. So if the research is about the ability of students in formulating the students' problem, the object of research is the ability to formulate the problem of students, while the research informant is student of Islamic Elementary school Teacher Education who study the basic concept of natural science.

The subject of this research is the students of Islamic Elementary school Teachers Education department. To obtain informants here the researcher uses a document study



method to obtain the main data. Furthermore, to obtain more complete information the researchers conducted interviews with students.

Data collection techniques are techniques or ways that researcher can use to collect data (Kriyantono, 2010). Data collection techniques used are document studies and interviews.

The process of analysis in this research consists of three phases (Kriyantono, 2010), namely: data reduction, data presentation and conclusion.

RESULT AND DISCUSSION

According to Beni (2008), Anderson Taxonomy is one of the ways used in formulating learning objectives. This taxonomy can also be applied to classify the formulation of problems posed in the class. There are three areas or domains that Bloom and colleagues find in the taxonomy, they are: cognitive (the aspect of thinking); affective (attitude aspect); psychomotor (the skill aspect).

In relation to the formulation of this problem, the domain used is cognitive because someone who asks means thinking (the preferred thinking aspect). For this cognitive domain there are six levels, each level is demanded different thinking processes. In accordance with the level of difficulty of the six levels can be grouped into two groups namely: lower level cognitive questions, knowledge; comprehension; and application and higher level cognitive questions, analysis; evaluation; create.

From the six levels will be described as follows: 1) Knowledge Question. This question is a reasoning question in the lowest category, which only requires students to be able to re-reveal knowledge about facts, events, definitions and so on. Students are only required to recall what they learned. The common words used for this knowledge question are: What ?, Who ?, Where ?, Where ?, Mention !, Remember the term, Define the definition !, Pair !, Name it !, and Group !; 2) Understanding questions. This question asks to show that he has understood something. He is said to understand something means he has been able to organize and recapture what he learned by using his own sentence. Some words that can be used for understanding questions are: Differentiate, Explain, Conclude, Compare, Explain in your own words, Translate, Change, Give examples, and Provide interpretations; 3) Application questions , The application question is a question that demands an answer by using the information previously obtained. Students are faced with simple problem solving by using the knowledge that they have learned. By using the concepts, principles, rules, laws or processes learned previously, students are expected to determine a correct answer to the problem. Some commonly used words for application questions are: Use, Show, Demonstrate, Make something, Look for a relationship, Write an example, Prepare it, and Classify it.

The high-level question categories include : 4) Analytical questions. This question is the first level of a high-level question group. The analytical question requires students to think deeply, critically, and even create something new, to answer the analytical question, the student must be able to decipher the causes, motives or make deductions (from generalization / general conclusions / law / theory, searchable facts -factly). Therefore, analytical questions



does not only have one correct answer, but also alternatives. The analytical question requires students to engage in the following cognitive processes: outlining the reasons or causes of an event; considering and analyzing available information in order to reach a conclusion or generalization based on information; and analyzing conclusions or generalizations to find evidence that supports or denies that conclusion / generalization. The words that are often used in analytical questions are: Analyze, Clarify evidence, Why, Identify, Show why, and Give reasons; 5) Evaluation question. This question demands the highest thinking process and to be able to express opinions or assess ideas, artwork, problem solving and the reasons for its decision, while certain criteria should be used. Evaluation questions can be categorized as follows: questions that ask students to give opinions on various issues; questions that assess an idea; questions that ask students to define a problem-solving; and questions that ask students to determine the best artwork; 6) Creating Question. This question is a high-level question that requires students to think original and creative. The following are often used words in the questions of creating: Collecting; setting; designing; making; creating; clarifying; composing; compiling; coding; combining; facilitating; constructing; formulating; connecting; creating; and displaying.

According to Wartono (2003), questions based on their nature consist of: 1) Memory Questions. Memory questions are questions that require students to recognize or recall what they have learned. "How many kinds of magnitudes are in physics?"; 2) Understanding Questions. The question of understanding is a question that asks students to prove that they already have enough understanding to make up a material that is known steadily. For example: "Please explain in your own language, how the process does interference in light waves?"; 3) Analytical Question. The analytical question is a question that requires students to think critically and profoundly. Usually students are asked to look for reasons or causes of a problem or can also analyze an informant. For example: "why does gas' pressure increases while it is warmed?"; 4) Synthesis Question. The synthesis question is a high-level question that asks students to present a pure and creative mind. For example: "What will happen if two different weights are dropped together from a tall building?"; and 5) Evaluation Questions. An evaluation question is a high-level question based on the mental processes involved. The evaluation question does not have one absolute correct answer and does not have a single answer. For example: "What do you think which the easiest way to solve this integral problem?".

Based on document study that have been done on the laboratory report of the Basic Concept of natural science subject, students of Islamic elementary school teacher education of the State Islamic University of North Sumatra Medan for 1 month, obtained information about the ability to formulate their problems. The informant as the research subject is the students of Islamic elementary school teacher education which amounted to 140 students.

The benchmark assessment of capability in this study is the cognitive sphere that has been revised by Anderson, namely: knowledge, comprehension, application, analysis, evaluation and create. The formulation of problems that have been designed by students is compared to Anderson's cognitive domain, because the ability to formulate the problem can also be used as a clue for owned cognitive level.



The formulation of the problem that questions "what is definition?" requires an answer to the cognitive level of knowledge. The formulation of the problem that questions "what is the trait?" requires an answer to the level of understanding. Problem formulas that question "how is to group?" requires an answer at the application level. The formulation of a question that questions "how is the process" requires an answer at the cognitive level of analysis. A problem formula that questions "what will happens if" requires an answer at the evaluation level. Problem formulation that questions "can it be done with different materials / procedures for the same results" or "can it be done with the same material / procedure for different results?" requires an answer at the creative level.

The data about ability in formulating problem that is owed by student of Islamic elementary school teacher education State Islamic School North Sumatra Medan, can be seen on the following table:

No.	Cognitive domain	Percentage of Student's ability
1	Knowledge	54 %
2	Comprehension	8 %
3	Application	8 %
4	Analysis	31 %
5	Evaluation	-
6	Creativity	-

Based on the table above, the results of the analysis show that the ability to formulate the students' problem is 54% at the knowledge evel, 8% at the level of comprehension, 8% at the application level, 31% at the level of analysis and none to the level of evaluation and creativity.

Further, if these six levels of cognitive thinking are grouped to high and low level, they will get result as followings:

No.	Category	Percentage of Students' achievement
1	Low	69 %
2	High	31 %

The results of the analysis based on the table above can be concluded that the ability to formulate the problem of students of Islamic elementary school teacher education Faculty of Tarbiyah and Teacher's Training - State Islamic University Medan is dominant on low category. Based on the results of this analysis, it is necessary to do treatment, so the ability to formulate students' problems increases before inquiry learning model is applied on basic concept of natural science learning.



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CONCLUSION

The results of the analysis show that the ability to formulate the students' problem is 54% at the knowledge level, 8% at the level of comprehension, 8% at the application level, 31% at the level of analysis and none to the level of evaluation and creativity. The research result will be continued by the other research with the aim of improving the student's ability in formulating problem which becomes research prerequisite of inquiry learning model application .

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