

The Application of Inquiry Learning Method in Natural Science Subject

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Abstract : This research is conducted due to the lack of science practice activities for students Grade VII at MTs Al Fudlola, a junior high school located in Porong, Sidoarjo. These lack activities drive students to have a low interest in learning process. In fact, guidance for the practice activities can be found in textbooks and practice-books (LKS), but it is not contextual and applicable enough. Therefore, this research is purposed to improve interests and understanding of students Grade VII at MTs Al Fudlola on environmental pollution. A main problem found in conducting this research is the students have no concerns and curiosity on environmental issues around them even though their school is only a kilometer far from the central of mud bursts, known as Lumpur Lapindo. Then, an alternative to deal with this matter is by applying Contextual Education Approach through Inquiry Learning Method. There were 23 students of Grade VII at Mts Al Fudlola took part in this research. The data obtained are qualitative and quantitative. The result of this research reveals that students' interest and understanding on nearest neighbor environment has improved. It can be seen through their final great score and their initiative to take solidarity on the day of Memorial of Lapindo Mudflow Tragedy.

Keywords - contextual education, inquiry method, environmental pollution, findings on studying science

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I. Introduction

Formal education in Indonesia often orients towards the quality of teaching and learning in the classroom and disregard direct educational relation to surrounding conditions. This is because the curriculum of education is centralized and specifically regulated in the provisions by the government. Students will inevitably end up focusing on learning scores and making impact t the decreasing level of their awareness to the environment. It does not mean that the materials taught in school especially in science subject are not cognitively useful to students, only occasionally they are too mainstream that teacher skips to relate the actual examples occurring in the neighborhood.

A widespread issue about the quality of education today is the inability of students to solve problems in everyday life. Yet this is very important because it is long-term oriented, not just finished when they are in school environment. Any student who gains knowledge in school should be able to apply what he or she earns to their daily lives. Knowledge should become the provision of life when joining in the midst of society as part of it.

Currently, it appears a new paradigm in learning activities, where students are invited to be in a natural situation. According to this, the learning process of students will be more meaningful if they are in such situation. They do not merely comprehend, but must experience the most real experience in the process. This paradigm that later produces a contextual approach in the learning process.

Contextual education with inquiry method is one of the alternatives in increasing students' learning interest and their awareness to the environment. "Contextual education is always rooted in the most important local values to the society and then developed into enrichment within the framework of the curriculum. It also increases teachers' competence to explore local values so students can learn from natural surroundings," explained Education Team Leader of Wahana Visi Indonesia, Nurman Siagian, in his press release.

Based on the final semester evaluation session at MTs Al Fudlola Porong, which is a discussion activity between teacher and students of Grade VII, it reveals that one of the subjects with lower score is natural science subjects. The reason is that students find it difficult to understand the material described by the teacher and do not comprehend why the material should be given to them. In addition, the lacks of practicum activities cause the subject to be monotonous where the students only study by memorizing and doing much theory exercises from LKS. Lack of facilities including science laboratories, props, and learning media in the school bring practicum activities in less optimum.

Table 1. Learning Score of Natural Science Subject (IPA) on Grade VII at MTs Al Fudlola in two recent years

Semester and Academic Year	Subject	Average Score
Semester I 2015/2016	Natural Science	68.8%
Semester II 2015/2016	Natural Science	65.4%
Semester I 2016/2017	Natural Science	66.7%
Semester II 2016/2017	Natural Science	63.5%

If we take a look to the lack of existing facilities, the teachers then rely on materials presented in Student’s book prepared by the government for the implementation of Curriculum 2013 along with LKS which discusses related materials. In the Student’s book and LKS, there are actually various guides and instructions for practicum and group activities. It is only less applicative when associated with the needs of the students in connecting the book’s material with their everyday life.

In science subject for Grade VII, there are nine chapters which are the combinations of physics, chemistry, and biology. Based on the revised version of 2014, Student’s Book of Science [1] in last chapter of second semester, it discusses a theme of the interaction of living creatures with environment and consisted of five sub-chapters such as: Environment Definition, What Can You Find in An Environment?, Interaction within An Ecosystem Forming Patterns, Human Interaction Patterns Influencing Ecosystems, and Miscellaneous Environmental Pollution and Global Warming. The researchers only find a bit regarding the environmental pollution material which make lab activities offered by "Student’s Text Book" were very limited compared to other materials. Even though, the material of environmental pollution is also important to be discussed and studied intensely by the students. We recommend that this kind of material be more explored to increase students’ awareness toward their environmental conditions.

Let's Do It

knowing the forms of interdependence

Asking
How are the forms of ...?
What you need is as follows:

1. Stationary
2. magnifying glass (if necessary)

Trying
Do the following steps

1. Pay attention and look at the ecosystems in the fields, fish ponds, grasslands, or other ecosystems around your school!
2. Can you determine the forms of interdependence among the components in the ecosystem?

safety instructions
be careful in making observations, do not pluck plants and do not make direct contact with the animals you meet, wash your hands after doing this activity.

3. record your observations in the following table

No.	organism I	organism II	forms of interdependence

Figure 1. One example of practicum activities provided by Student’s Book of Science for Semester II

Geographically, MTs Al Fudlola is located in the central Porong Sub-district of Lapindo Mudflow. Its position is directly opposite Porong Highway and only about one kilometer from the mud embankment. Lapindo Mudflow is a disaster that occurred since May 29, 2006 and lasted until now. In response to this condition, people often regard mudflow as part of a less natural disaster, not an industrial one that harms many people. On the other hand, teenage students also rarely understand the causes of this disaster so they do not identify Lapindo mud as a disaster that threatens their lives and the environment around. Therefore, this research uses inquiry method as a way of developing scientific learning process in school. This is done to develop students' understanding in subject matter of science related to the contextual situation around them especially to Lapindo mud disaster. At the same time, this research is also a part of the effort to anticipate and find a solution in overcoming the problem.

1.1. Contextual Education Approach

Basically, the application of a contextual approach in educational methods requires teacher's sensitivity in observing students' needs. When teacher understands these needs, he can offer a variety of fun learning activities, which also directly relate to the problems in students' everyday life. Contextual teaching and learning (CTL) is a learning strategy that emphasizes full involvement of students to find the relation between material learned and reality that can encourage them to apply it in everyday life [2]. The philosophical base of contextual learning is constructivism, where learning is not only to memorize, but also construct knowledge in students themselves. It is emphasized that contextual education is fundamentally a learning system based on the philosophy where a student's success measured by his ability to absorb the lessons and relate new information to the knowledge and experience he has already possessed [2]. In line with that, Johnson stated that three pillars in contextual system [3] are described as follows:

- a) Contextual reflects the principle of interdependence for instance, when students unite to solve a problem;
- b) Contextual reflects the principle of differentiation;
- c) It becomes visible when arising students' respect in each other's uniqueness, differences, be creative to work with each other, and also generate new and different ideas;
- d) Contextual reflects the principle of self-organization;
- e) It is seen as students search for and discover their own different capabilities and interests, reviewing their performance in solving problems.

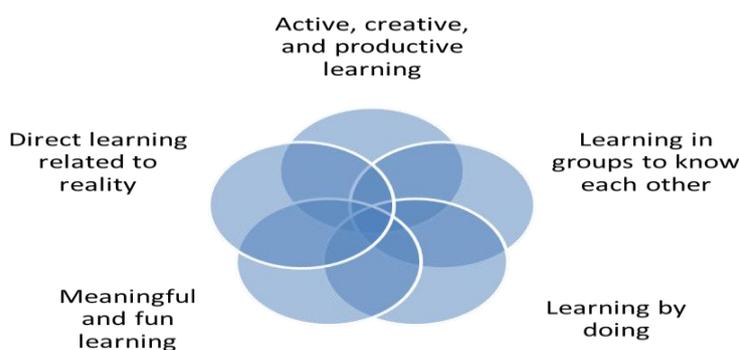


Figure 2. Characteristics of Contextual Approach [4]

1.2. Contextual Learning Components

It is confirmed that a class is regarded to use a contextual approach when applying seven main components as follows [5]:

1.2.1. Constructivism

The process of building or composing new knowledge in the cognitive structure of students based on experience. In contextual learning, the implementation of constructivism leads them to experience thinking development because they are allowed to easily express their thoughts.

1.2.2. Inquiry

The learning process is based on the search and discovery through systematic thinking. Those will involve students to discover new knowledge.

1.2.3. Questioning

In contextual learning, teacher does not merely convey information, but attracts students to ask questions frequently where they are also able to find the answer by themselves.

1.2.4. Learning Community

Through social interaction, learning will be more meaningful, whether by cooperating with groups or communities both formally and naturally. Learning outcomes will be obtained by communicating with friends or communities.

1.2.5. Modeling

In contextual learning, it emphasizes the importance of modeling. By doing so, students will be more easily to understand the subject matter by demonstrating something as an example that can be imitated.

1.2.6. Reflection

Reflection is the process of looking back, recalling, and re-analyzing the events or learning events that students have processed. Through the process, it has possibility for the students to update or increase knowledge based on the thoughts that they respond.

1.2.7. Authentic Assessment

The real assessment is the effort made by teacher in collecting various information and data concerning the learning development in students. This assessment can be done by means of real activities along with the learning process.

1.3. Definition of Inquiry Method

This is a method of learning that emphasizes the critical and analytical thinking process in searching and finding answers to appearing questions. This learning model needs to be implemented to find an appropriate alternative with reference to the development of learning models that can directly enable students and involve teachers as partners in the learning process.

Inquiry method is a teaching method which tries to lay the groundwork and develop a scientific way of thinking. In the application, students are required to learn more on their own and try to develop creativity in the development of dealing problems. Inquiry teaching will create an effective and conducive learning condition, as well as facilitate easier teaching and learning activities. In this research, it is interpreted as instructional technique in teaching and learning process, allowing students directly to deal a problem, where the main purpose is to assist students in developing scientific discovery skills.

Pursuing this further, this is a way of conveying the lesson by examining something critically, analytically, and argumentatively using certain steps for conclusion [6]. The implementation of inquiry method in teaching and learning process eventually demands students' activeness in both individual and group learning.

1.3.1. The Types of Inquiry Method

This research administers three types of inquiry method at once. Those are guided inquiry, free inquiry, and modified free inquiry. This is done according to the problem context as indicated in the background where the students need to be stimulated by the teacher to be able to identify the conceptual issues in everyday life. Nevertheless, this research remains to put the students as the main actors. They directly do the problems formulation and investigation in the field. Here are the following three types of inquiry method which are used [7].

1.3.2. Guided Inquiry

Guided inquiry is primarily used for students who have not had the experience of learning through inquiry method. In this case, teacher provides widely guidance and direction. In its practice, most of the planning is made by the teacher while the students do not formulate problem

1.3.3. Free Inquiry

In free inquiry, students conduct their own research like a scientist. This learning requires students to be able to identify and formulate the various topics of investigated problems. The method is an inquiry role approach which involves students in a particular group. Each group member has each task, for example as a group coordinator, technical coach, person for data recording, and process evaluator.

1.3.4. Modified Free Inquiry

In this inquiry type, teacher gives problems and then students are asked to solve through observation, exploration, and research procedures.

The steps in this inquiry process are [8]:

- a. Tell the students that they have curiosity towards something;
- b. The problem formulation should be prepared by students;
- c. Establish a temporary answer or hypothesis;
- d. Seek information, data, and facts needed to answer problems or hypotheses;
- e. Draw a conclusion or generalization;
- f. Apply the conclusion or generalization of the new situation.

The strategy of implementing this inquiry method is described as follows [9]:

- a. The teacher gives explanations, instructions or questions on the material to be taught. Before beginning the lesson, the teacher should understand the extent to which students have perception on the material. Then together they compare perceptions with different opinions or existing theories;
- b. Teacher assigns tasks to students to read or answer along with homework;
- c. The teacher provides an explanation for issues that might confuse students;
- d. Recitation to embed the facts they have learned and having them understood;
- e. Teacher provides information as a complement and illustration of the presented data;
- f. Discuss the application and perform according to the information;
- g. Summarizes in the form of a formulation as a conclusion which can be accounted for.

II. Research Methods

This research was conducted at MTs Al Fudlola, Porong Sub-district, Sidoarjo Regency. The research subjects were students of Grade VII in the Academic Year of 2016/2017 with the number of 23 students where 11 male students and 12 female students. The implementation is done in three meetings (1 meeting = 2 hours lesson with 45 minutes of each hour) with following details:

First Meeting

1. An introduction of Environmental Pollution Material:

- a. Students read environmental pollution material in text book and LKS for 15 minutes;
- b. Teacher encourages students by asking them to be aware of the environmental problems. Such awareness will lead to the process of identifying critical environmental pollution that occurs in their environment, both at school and home;
- c. Teacher plays a short film called Anak-anak Lumpur (Mudblood Children) by Danial Rifki;
- d. Teacher asks for students' impressions and opinions based on the film;
- e. Teacher divides the number of students into three groups.

Second Meeting

2. Observation to Lapindo Mud Location:

- a. Students are invited to observe around the location of the Lapindo Hot Mudflow;
- b. Students are encouraged to actively ask the society around concerning the disaster;
- c. Students record their questions and findings while in the field;
- d. Students and teacher formulate issues related to environmental pollution due to hot mudflow;
- e. Teacher provides group tasks to be done at home; specifically searching data about Lapindo Mud in media including newspapers and internet, and then analyze it.

Third Meeting

3. Discussion

- a. Students in each group have to present their research findings;
- b. There is a question and answer session for each presenter group;
- c. Teacher assists to add data if it still lacks and invites students to draw conclusion together;
- d. Students fill out the evaluation sheet with the conclusion and proposal they offer to reduce environmental pollution and the impact of Lapindo Mudflow.

Several actions to be undertaken in this research include: a) action planning; b) implementation of action; c) observation; and d) reflection. Technique used (in analyzing data to determine learning mastery by using formula) is described as follows.

Students' Individual Absorption Power

$$DSI = \frac{\text{scores obtained by students}}{\text{maximum test score}} \times 100\%$$

Individual Absorption Power (*DSI*) of the students is said to be complete if *DSI* is more than or equal to 65%.

Students' Mastery Learning in Classical

$$KBK = \frac{\text{the number of students who meet the standards}}{\text{the total number of students}} \times 100\%$$

Mastery Learning in Classical (*KBK*) of the students are said to be thoroughly classical when more than or equal to 80%.

Percentage of teacher and students' activity is calculated by the following formula (Masyitah in Rasyid, 2010:15):

$$\text{the percentage of the average value(NR)} = \frac{\text{the number of students who meet the standards}}{\text{maximum test score}} \times 100\%$$

Notes:

90% - $\leq NR \leq 100\%$ = Very good

80% - $\leq NR \leq 90\%$ = good

70% - $\leq NR \leq 80\%$ = Fair

60% - $\leq NR \leq 70\%$ = poor

0% - $\leq NR \leq 60\%$ = Very poor

III. Results and Discussion

This discussion will explain the learning process based on the contextual approach through inquiry method as previously described in theoretical basis. This explanation will describe the process of method applying in each meeting as follows:

1.4. First Meeting

At the first meeting, teacher instructed students to read Environmental Pollution material in text book and LKS for 15 minutes. In this case, the teacher keeps the classroom conducive so that students comprehend the text well. When the time is up, teacher starts to provide some evaluative questions and prohibit them to open the book, among other things: what is environmental pollution? why environmental pollution can happen? how to prevent environmental pollution? and how to restore the cleanliness of the contaminated environment? Such questions were randomly asked by the teacher to some students. Based on these questions, it appears that students are still very textual. They seemed on edge to keep the book open so the answers were simply to move the text in verbal form and not the result of individual understanding of the reading. This is because the tendency of their usual method of learning is memorizing, not understanding. However, when the teacher tries to spell it out with the explanation that environmental pollution is something that can happen anywhere including our environment such as school and home, they appear to be enthusiastic. They begin to identify the results of their reading with concrete examples that they always encounter in everyday life. Therefore, the teacher then throws new questions to them that are 'what are the examples of environmental pollution around us?'

Through this question, the students seem to begin to imagine and some who are asked explain that those pollution are often found in school and neighborhood environments such as littering, the number of vehicle emissions and most of all, many students respond with examples of air pollution and factory waste. Thus, the mentioned examples clearly prove that Sidoarjo is dominated by industrial factories. This also suggests that they are beginning to be aware to identifying the environment by reading the textbook. At this moment, the role of teacher is required to be patient enough for gaining students' understanding to relate to concrete examples in their environment.

For sharpening the students' identification toward pollution issues in their environment, the teacher plays them a short film entitled "Anak-Anak Lumpur" (Mudblood Children) by Danial Rifki. Having them watch, they are mesmerized by the story line. They asked what causes Lapindo mudflow as well. At that time, students can identify that Lapindo Mud can leave bad impacts to our respiratory tract due to polluted air of the toxic gases. This identification refers to the film events especially when a mother as one of main characters died due to shortness of breath by inhaling air around Lapindo Mud. Therefore, the students realized that Lapindo mud is part of the disaster that endangers them and occurred because of human activities. At that point, the solution must be revealed by understanding the causes.

Through this film, students then realize that the current condition becomes as an enormous environmental pollution. They who previously understood it as a mere disaster have now turned that it has serious and harmful effects of environmental pollution caused by the exploitation of natural resources by some responsible parties. In this matter, the teacher then engages them to have a deep awareness by asking the impression, especially their understanding of the film. Such questions are in fact a way to encourage students to reflect on waste disasters to enable them identify the causes and consequences for anticipation and prevention. To prove the causes of this disaster, at the second meeting, there will be direct observation in the field as the response to the problem formulations in particular: What causes the emergence of this Lapindo mud disaster? What are the impacts of Lapindo Mud Disaster? How about natural changes since Lapindo mudflow?

1.5. Second Meeting

The second meeting is an important one because students are not only in the classroom and deal with textbook, but directly face a concrete phenomenon by visiting the location around Lapindo Mud. To be more effective as well as to gain well cooperation among students, the teacher divides one class into 3 groups where they do the observation above Lapindo mud embankment. In there, they recorded and identified the natural condition by answering the questions from textbook such as what plants that still survive, how the current condition of the mud and the embankment are, and other possibilities if such condition continues to be ignored. In addition, they are also required to interact with the surrounding community by asking the causes of this

disaster. The teacher here attempts to guide the students so that they are able to answer the problem formulation that has been recorded at the first meeting.

Through this method, it is revealed that students clearly understand that Lapindo Mud has eliminated existing plants and vegetation such as rice fields and plantations. By conducting interaction with the surrounding community, it is also known that this has an impact on the loss of their former livelihoods as farmers or working job in gardens. For them, the existence of mud is not only a natural disaster, but also the effect of mining industrialization which seeks to exploit resources unwisely. This is demonstrated by the drilling that is too speculative and too imposing at tremendous depth. In line with that, the observation and notes written by students makes the teacher understands that the students have been able to not only understand the material, but also actively engage regarding environmental pollution around them.

1.6. Third Meeting

At the third meeting, the students presented their research findings with paper cartons and clippings. Question and answer session is quite effective. The students seemed enthusiastic. They shared their experiences on the results of the observation. It is known that the plants that originally grew there are now buried by mud. The whole land is now covered by mud which growing thicker days by days. Therefore, the people who formerly lived there and relied on the potential of paddy fields and plantations are now shifting and replacing livelihoods such as opening semi-permanent stalls and other mixed jobs. Equally important, from the interaction with the surrounding community, all of the students' presentation explained that the existence of this hot mud is difficult to overcome and possibly leads to increasing volume and will drown the other adjacent areas. In consequence, the effects of the environmental pollution will absolutely continue to occur. When explaining, the students look confident as well. They are even like imitating the statements expressed by the surrounding community from the previous conversation.

Moreover, they are also looked sure in explaining that the existence of this mud is not a natural disaster, but a catastrophic effect of unwise actions. They believe that mining through drilling should be done more measurably and ethically by maintaining environmental sustainability. Even at a certain point, they also explained that although the settlement of compensation from the responsible party to the victims is almost complete, but environmental pollution is still happening and the threat of prone land and broken embankment still lurking. Thereupon, they give a closing remark that the authorized companies to carry out this exploitation must be consistently accountable, not off the hook by simply providing compensation. Students also suggest to the next generation including to themselves, in order to keep the environment around us, it is wise to avoid actions that emerge environmental pollution. Mining activities must be carefully calculated so as to avoid catastrophic events, and to initiate preventive measures as well such as maintaining and caring for environment by not chopping down trees illegally, destroying crops, dumping waste according to the place, and so forth. Students did not forget to propose that MTs Al Fudlola participates in solidarity and commemorates Lapindo Mudflow.

Based on the implementation of contextual approach using inquiry method as conducted in MTs Al Fudlola's students, it is known that natural science (IPA) subject with the material of environmental pollution has been successful. It is shown by not only the enthusiasm of the students in understanding the material, but also involved. At the first meeting, it appears that they initially had no awareness to environmental pollution that was happening around them. However, through teacher explanations and interventions in discussion and film screening, students were aroused to contextually understand the material from the textbook.

At the second meeting, the teacher's active role by engaging the students to direct observation to the location in giving a chance for them to identify and find out the causes of the mudflow is very effective. They involve and even interact directly with the atmosphere of the local community, so that they are able to understand the problems faced. To be known, the mud has damaged the entire ecological order of rice fields and plantations that make the environment are clearly polluted and the surrounding community was forced to switch professions. While at the third meeting, the students seemed eager to present their findings in the field and concluded that Lapindo Mud is not a natural disaster, but a human error that should be addressed with more responsibility. They also suggested that students must participate actively in preventive measures of environmental pollution including students in Mts Al Fudlola to make the inhabited environment becomes sustainable to live in. Thus, the learning material in textbook is well understood through observation and invites them to be involved which also affecting their complete grades with good and excellent score between 78 and 90. This assessment is considered by standard parameter as described on the theoretical base that score of 80-100 is given if a student understands and is able to explain the material well.

IV. Conclusion

Based on this research, it is known that the contextual approach through inquiry method has successfully and effectively transmitted science especially natural science (IPA) subject with environmental pollution material. Students are not just memorizing and understanding the conceptual concept of environmental pollution, but also identifying, experiencing, and engaging with such issues around. In this case, the students of Grade VII at MTs Al Fudlola understand that Lapindo Mudflow is the effect of environmental pollution due to unwise drilling resulting in disaster. They understand that such phenomenon can be prevented by basing themselves on humanity in order to have awareness for keeping sustainable environment. Although they are required to be independent in relating the material to contextual problems, the role of teacher is vital as well. It becomes the key to encourage students to bring out their independence. Teacher can stimulate with fun media such as playing movies, asking daily questions, and invite students to related scenes. Thus, students are truly led to engage with problems. Through the application of this method, the success of learning is proven and the transmission of knowledge is fruitful which leads their mastery learning to gain.

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