Students’ profile about analytical thinking skill on respiratory system subject material

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Abstract. Analytical thinking skills are important for students to learning of respiratory system material. This does not only require students to understand the concepts and principles, but also the applications in life. The aim of this research is to determine the analytical thinking of student in working on the question concept of the respiratory system. It used the descriptive method with 74 students as subjects. The instruments used test that based on the Facione's analytical thinking skill indicator. The data process techniques used: score on each question, change the score and grouping the subject levels obtained by value and conclusion. The results show that percentages of students with the category of analytical thinking skills were: the very poor 49%, poor 42%, fair 9%, and there were not obtain students with a good or excellent score of analytical thinking skill. Achievement of students’ analytical thinking skill indicators: Interpretation 34.97%, Identifying 41.89%, Generating Hypothesis 11.15%, and Inference 18.24%. In conclusion that the analytical thinking skill of students relatively low. Based on this research suggested needs teacher effort by practice the students to answer analytical questions or using the right strategies that can foster students’ analytical thinking skills.

1. Introduction

Respiratory system material is a material in Biology learning that has a high complexity and very closely with the phenomena encountered in real life. The concept of the respiratory system material is abstract and complex so it is not enough just to memorize the theories. The concept of Biological material including the non-simple respiratory system requires students to have analytical thinking skills so that students are able to understand the theories and compare it with the symptoms of daily life [1].

The analytical thinking skills are the ability to identify the true intentions and relationships of conclusions between statements, questions, concepts, descriptions or other representative forms to express the beliefs, reasons, information, and opinions needed to meet the challenges of the 21st century. According to Facione [2] the analytical thinking skill is divided into 4 indicators, namely 1) interpreting information and ideas, 2) identifying the similarities and differences in the reality of the information presented, 3) developing hypotheses, 4) describing the relationship of sentences or parts of a concept to make a decision.

Analyzing action is defined as the action of breaking the data into sections, then linking those parts in a meaningful and useful relationship to problem-solving [3]. Scumacer [4] states it is important for students to optimize analytical thinking skills to solve everyday problems and issues in long-term life.
The fact of students' analytical thinking skill in Indonesia is still low. It can be seen from the achievement of Indonesia in Trends in International Mathematics and Science Study (TIMSS). Assessments in TIMSS are measured in two domains, the content domain, and the cognitive domain. The content domain is used to define the subject matter, while the cognitive domain is used to determine the thinking processes used by students related to knowing, applying, reasoning, analyzing, evaluating and creating. Analyzing is also a domain of analytical thinking ability. Based on the five times Indonesia's participation in TIMSS is in 1999, 2003, 2007, 2011, and 2015, the achievement of Indonesian students' ranking is always included in low ranking countries. These low TIMSS results show that Indonesian students are not yet accustomed to dealing with problems that require high order thinking skill aspects, i.e. problems that require reasoning, applying, analyzing, evaluating and creating [5].

The problem of students in analytical thinking skill also has been the concern of current research, where the education system is shifting to one that is more inclusive the explicit of teaching thinking skills in all classrooms will be crucial [6]. This is evidenced also by Yee Mei Heong [7] which states that among the 5 components thinks the taxonomy of bloom analytical thinking is the lowest. In line with the research conducted by Ergül [8] which states that the analytical thinking contributes substantially to student achievement of 13.69%, which includes analytical reasoning and analysis of explanation.

Analytical thinking skill becomes an important part in solving respiratory system problems so that students make the right decisions to determine solutions and other impacts of found problems [1]. The analytical thinking skill can arise when students are faced with unusual problems, uncertainties, questions or dilemmas [9]. The success of applying this skill can be seen from explanations, decisions, performances, and outcomes applicable to knowledge and experience [10]. Therefore, it is important for this research to find out how much students' thinking skill in analyzing the problem of the respiratory system.

2. Method

This research was conducted to find out the initial profile of students' analytical thinking skill in Kotabumi. The method used in this research is a descriptive method. Descriptive method is a research method used to collect information on the subject of research. Subjects in this research were high school students of XI IPA class in Kotabumi, academic year 2016/2017, amounting to 74 people. Subjects come from two different schools.

The instrument used in this research is the analytical thinking skill test which is prepared based on the facione’s indicator and the respiratory system material indicator. Prior to the study subjects, the instrument test of analytical thinking was validated by expert lecturers and education practitioners. The test form is a written test with a total of 5 questions. The competencies assessed in this test include 4 indicators of analytical thinking according to Facione [2], i.e. interpreting information and ideas shown in questions 1 and 2, identifying the similarities and differences in the reality of the information presented (identifying) question number 3, build the hypothesis (generating hypothesis) shown in question number 4, and describe the relationship of a sentence or part of a concept to give a decision or inference shown in question number 5. Each student is given a set of questions test analytical thinking skill of respiratory material system. The time given to answer the question is 45 minutes. Data profile of students' analytical thinking skill obtained from the score of correct answers obtained by students. The top score for each answer is 4 and the bottom score is 0. So the maximum score of the whole correct answer is 20. Then change the score to a value, calculated through the calculation as follows:

\[ \text{Value} = \frac{\text{Score Gained}}{\text{Maximum score}} \times 100\% \]

After getting the value of each subject, then grouping research subjects into categories very poor, poor, fair, good, and excellent based on the value of each indicator of analytical thinking ability obtained. Next, analyze the data obtained and describe the data.
3. Result and discussion

Results of achievement about analytical thinking indicators of students can be seen in table 1. Based on these data, it is seen that the achievement of analytical thinking indicator ranged from 11.25% to 41.89%. Although still in the poor level category, indicator identifying occupy the highest attainment with a percentage of 41.89%. While the lowest gain in generating hypothesis and inference indicators, its achievement is still very poor that is 11.15% and 18.24%. However, most students have been able to build basic thinking skills to distinguish relevant and less relevant information, as seen in the interpretation aspect, although still get a poor yield of 34.97%. As a result, students' thinking ability analysis is still low.

Table 1. Percentage of student achievement on indicators of analytical thinking skills.

| The Indicator of Analytical thinking skills | Percentage of achievement (%) | Category  |
|-------------------------------------------|--------------------------------|-----------|
| Interpretation                            | 34.97                          | Poor      |
| Identifying                               | 41.89                          | Poor      |
| Generating Hypothesis                     | 11.15                          | Very Poor |
| Inference                                 | 18.24                          | Very Poor |
| TOTAL                                     | 28.17                          | Poor      |

The results of students' analytical thinking tests are categorized to be very poor, poor, fair, good, and excellent as seen in figure 1. Based on the diagram, the percentage of students with the very poor category of 49%, poor by 42%, fair only 9%, and not obtained students with good or excellent analytical thinking skills.

Figure 1. Percentage of students' analytical thinking skill in each category.

Thinking analysis is the skills to subjugate a situation, object problem or decision on a rigorous and step-by-step examination [11]. The indicators of analytical thinking skills according to Facione [2] are, (1) interpreting information and ideas (2) identifying the similarities and differences of reality from the information presented (identifying), (3) developing hypotheses, (4) describes the relationship of a sentence or part of a concept to make a decision (inference).

Students studying the material of the respiratory system are not only required to master the concept, linking the accepted concepts to learning with the phenomena found in daily life, as well as the need for high-level thinking, such as analytical thinking to study it intact [1]. Bailin [12] states that analytical thinking skills are very important in learning science including biology. The analytical thinking skills of the students greatly facilitate the students to link the related information, not only learn the concepts but also learn how to apply in daily life [4,13].

Empowerment of thinking is not optimal analysis can be seen primarily in the very poor skills of students in generalize hypothesis and inference aspects. These results can be due to a lack of understanding of student concepts when dealing with problems relating to problems in the respiratory system material. Students only try to think low-level by memorizing the concept so that it is difficult to log a temporary answer and conclude with a general statement. This problem could happen because
of many factors. The teachers mostly only give the routine questions and it makes the students do not optimize their analytical thinking. According to Sulistiani [14], usage of routine questions causes the low students curiosity, so it impacts on students have not fully been able to do the questions based on the higher order thinking standard.

The low percentage of students' analytical thinking skills also can be due to the teacher's learning strategy not yet oriented towards the empowerment of analytical thinking skills levels. Some of them are the teacher way of teaching only one way. This is in line with Kao's [15], which states that if students are accustomed to learning with strategies that require students to memorize learning materials, it will be difficult to develop logic and critical thinking skills including analytical skills. The students' analytical thinking ability can be developed by means of students being given the opportunity to observe, research and experiment based on problems presented by the teacher, review the literature and conduct discussions [16]. For the majority of the students, a learning analytics would help in terms of planning their learning activities [4].

4. Conclusion
The percentage of students' analytical thinking skills on the respiratory system material is relatively low. Analytical thinking skills of the students who are not trained with optimal due to the low activity of students while learning, learning strategies or methods used in school still have not facilitated the involvement of students in the discovery of material concepts and solving the problem of the respiratory system.

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