

# How is the concept analysis ability of high school students in Ilir Barat 1 Palembang?

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| Article Information                                                                                                                                                                                                                                                          | Abstract                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| <p><b>Keyword:</b><br/>Students' analysing skill;<br/>Human respiration system;<br/>Human circular system;<br/>Palembang city</p> <p><b>Kata Kunci:</b><br/>Keterampilan analisis siswa;<br/>Sistem pernafasan manusia;<br/>Sistem sirkulasi manusia;<br/>Kota Palembang</p> | <p>This study used the survey method to overview the concept analysis skills of high school students in Palembang City. This research was limited by the concept of the respiratory system and the circulatory system. The research sample (n=412) was a high school student from a school in Ilir Barat I District, Palembang City. The data was collected by using concept analysis questions, totalling 25 questions. The results showed that the concept analysis skills of high school students in Palembang City is "enough" (44,24%). The results of this study also showed that the analysis of the concept of high school students in Palembang City on the material of the respiratory system is better than the material of the circulatory system. The highest and lowest achievements per item can be seen in the respiratory system material (the highest achievement on item number 9 and the lowest achievement on item number 5). The results of this study indicated the importance of learning and assessment that train students' higher order thinking skills, so that concept analysis skills can also be increased.</p>                                            |
| <p><b>History:</b><br/>Received : 20/06/2022<br/>Accepted : 01/08/2022</p>                                                                                                                                                                                                   | <p><b>Abstrak</b></p> <p>Penelitian ini bertujuan untuk mendapatkan gambaran tentang kemampuan analisis konsep pada siswa SMA di Kecamatan Ilir Barat 1 Kota Palembang dengan menggunakan metode survei. Penelitian ini dibatasi oleh konsep sistem respirasi dan sistem peredaran darah. Sampel penelitian (n=412) merupakan siswa SMA yang berasal dari sekolah di Kecamatan Ilir Barat I Kota Palembang. Data dijangkau dengan menggunakan soal analisis konsep yang berjumlah 25 soal. Hasil penelitian menunjukkan bahwa kemampuan analisis konsep siswa SMA di Kecamatan Ilir Barat 1 Kota Palembang terkategori cukup (44,24%). Hasil penelitian ini juga menunjukkan bahwa analisis konsep siswa SMA di Kota Palembang pada materi sistem respirasi lebih baik jika dibandingkan dengan materi sistem peredaran darah. Capaian tertinggi dan terendah per item soal terlihat pada materi sistem respirasi (capaian tertinggi soal nomor 9 dan capaian terendah pada soal nomor 5). Hasil penelitian ini menunjukkan bahwa pentingnya pembelajaran dan penilaian yang melatih kemampuan berpikir tingkat tinggi siswa, sehingga kemampuan analisis konsep pun dapat meningkat.</p> |

## **A. Introduction**

Higher order thinking skills began to know the wider community after Benjamin Bloom put forward a theory called Bloom's Taxonomy (Tan & Halili, 2015). This theory suggests that changes in the learning process from just remembering to learning lead to the habituation of higher order thinking (Hyder & Bhamani, 2017). In its development, Bloom's Taxonomy underwent important changes made by Anderson & Krathwohl. These changes include the use of verbs for each cognitive level and the separation between the knowledge dimension and the cognitive dimension (Kocakaya & Kotluk, 2016). This change was made to adapt Bloom's Taxonomy to the development of the world of education in the 21st century.

The application of higher order thinking skills in learning is expected to help students generate productive ideas. The results of research conducted by Heong et al. (2012) showed that students have difficulty in generating ideas to solve the problems given. This is caused by the lack of understanding of the concepts possessed by students so that the process of forming ideas is hampered. Heong et al. (2012) also revealed that the difficulty of finding ideas had a direct impact on the low learning achievement of students because of the difficulties in completing the tasks given by the teacher.

The Ministry of National Education in the 2013 Curriculum has stated that in the learning process in the classroom it is necessary to use a scientific approach through discovery learning or inquiry learning. Meanwhile, to develop students' ability to produce contextual works, it is suggested to use a project-based learning approach. Previous research has shown that all these approaches and learning strategies are able to improve students' higher order thinking abilities (Ashari et al., 2021; Billah et al., 2019; Fajar et al., 2020; Launuru et al., 2021). The application of higher order thinking skills is not only applied to the learning process in the classroom, but also to the assessment process after the learning process is carried out. The Ministry of Education has directed assessments carried out at all levels of primary and secondary education in order to develop higher order thinking skills in the content of the 2013 Curriculum. This is because higher order thinking skills are able to encourage students to think broadly and deeply about the concepts being studied (Verdina et al., 2018). One of the cognitive levels of higher order thinking skills that needs to be developed is analyzing.

The results of the study of basic competencies in the Permendiknas, especially for Biology lessons, show that students are expected to have analytical skills for all the concepts taught. Concept analysis skills are very important as a starting point for developing Higher Order Thinking skills that all students also hope to have. To determine the level of student achievement of the basic competencies being studied, an evaluation process is needed that is in accordance with expectations in the basic competencies being studied.

The ability to analyze is indicated by the ability of students to describe problems or objects into simpler elements and determine how these elements are interrelated (Anderson & Krathwohl, 2001). In order to assess students' ability to analyze concepts, the explanation is translated into three indicators, namely distinguishing, organizing, and finding. Students who have been able to distinguish means that they have the ability to find differences in the parts that make up a structure based on the relevance, function and importance of these elements. The ability to organize is shown in the extent to which students are able to identify the elements of a situation and know how these elements are interrelated to form a system.

The ability to analyze concepts in students has a very important role in identifying and solving problems at hand. This analytical ability involves a reasoning process to carry out further investigations and resolve sometimes unclear global problems (Mayami & Nopiyanti, 2021; Joynes et al., 2019; van Laar et al., 2020). The analytical skills possessed by students can also be used as a basis for evaluating and producing new works as a continuation of the higher order thinking process.

The material for the respiratory system and the circulatory system is a concept that is studied in Biology subjects at both the junior high and high school levels. Both of these materials have a lot of conceptual and procedural knowledge. The concepts studied in these two materials are abstract and require special treatment in the implementation of learning. The difficulty of students to understand these two materials is because students cannot see directly the physiological processes that occur in these two systems. In addition, students' analytical skills are not optimally trained due to low learning experiences, inappropriate selection of learning strategies, and lack of school involvement in facilitating learning (Prawita et al., 2019).

Based on the description that has been described, researchers are interested in conducting research on the ability to analyze concepts in high school students in Palembang City. This study aims to get a comprehensive picture of the ability to analyze concepts in high school students.

## B. Material and Method

Research on the analytical ability of high school students in Ilir Barat 1 Palembang was carried out using survey research methods. This research is limited to the concept of the respiratory system and the circulatory system. Population in this research was all Senior High School in Ilir Barat 1 Palembang. The sample of this research was high school students in Ilir Barat I Palembang with cluster random technique. The number of research samples amounted to 412 students from 4 schools in Ilir Barat I Palembang.

This research was conducted by providing concept analysis questions. The questions used was multiple choice questions with five alternative answer choices for the concepts of the respiratory system and the circulatory system. The questions used are 25 questions. Each of the questions used has been through a test of test validity, item validity, reliability, discriminatory power, level of item difficulty, and distractor. The questions used in this study were developed following the framework of Anderson & Karthwohl (2001).

**Table 1 Question topic**

| No. | Question topic                               | Question number                    |
|-----|----------------------------------------------|------------------------------------|
| 1.  | The mechanism of action of human respiration | 1, 5,                              |
| 2.  | Disorders of the human respiratory system    | 2, 4, 7, 8                         |
| 3.  | The things that affect respiration           | 3, 6, 9                            |
| 4.  | Blood and blood clotting mechanism           | 10, 11, 12, 13, 15, 16, 17, 23, 25 |
| 5.  | Disorders of the circulatory system          | 14, 18, 24                         |
| 6.  | Circulatory mechanism                        | 19, 20, 21, 22                     |

Data analysis was carried out by evaluating the achievements of each student in solving the given concept analysis problems. Assessment of student achievement is carried out based on the assessment rubric that has been made previously. Each correct student answer is given a score of 1 while for the wrong answer a score of 0. After the assessment process is complete, the correct number of each student is converted to a value with a minimum range of values of 0 and a maximum of 100.

After knowing the achievement value of each student, the next ability to analyze the concept of

students is categorized into four groups, excellent, good, enough, and poor with the reference values in Table 2.

**Table 2 Reference values for grouping the achievement of students' concept analysis abilities**

| Students' achievement | Achievement category |
|-----------------------|----------------------|
| 76-100 %              | Excellent            |
| 51-75%                | Good                 |
| 26-50%                | Enough               |
| 1-25%                 | Poor                 |

To find out students' achievements for each item, a recapitulation was done using a tally sheet. Student achievement for each of the questions tested then calculated the percentage of achievement using the formula:

Item question achievement =

$$\frac{\text{the number of students answered correctly}}{\text{total students}} \times 100\%$$

(Source: BSNP, 2007)

The average achievement for each main concept tested was calculated to find out which main concepts were more easily analyzed by students. The average achievement for each of the main concepts tested in this study is calculated using the following formula:

Average achievement of the respiratory system concept/circulation system concept =

$$\frac{\text{Total achievement percentages}}{\text{Question total}} \times 100\%$$

(Source: BSNP, 2007)

## C. Results and Discussion

The results of students' achievements in analyzing concepts on the material of the respiratory system and circulation system are grouped into four groups, excellent, good, enough, and poor. This grouping is based on the calculation of the number of scores that are converted into values with a predetermined formula. The results of the research on the concept analysis ability of high school students in the city of Palembang on the material of the respiratory system and circulation system showed a tendency of achievement in the "enough" category (Figure 1). None of the students were categorized as "excellent" from the results of the research conducted. Student achievement scores are in the range of 64-12, with the highest category

"good" and the lowest category "poor". These results show better results with the results of research conducted by Parwita et al (2019) which

shows that the achievement of concept analysis skills in students shows a tendency to achieve in the "poor" category.

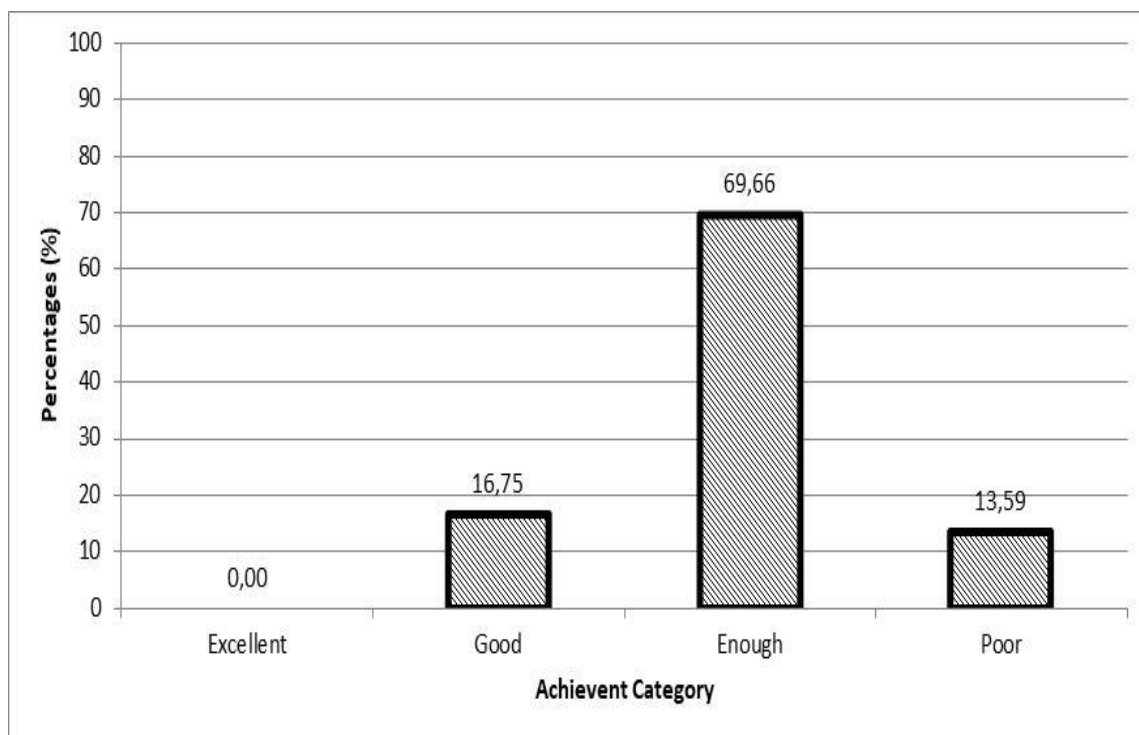


Figure 1  
Percentage analytical achievement

The ability to analyze consists of the ability to analyze knowledge, analyze conceptually, recognize procedural knowledge and recognize metacognitive knowledge (Kusuma et al., 2017). Anderson and Krathwohl (2001) explain that analytical skills are related to the ability to distinguish, organize, and find implied messages. The ability to analyze is a very important part of critical thinking. Students who already could think critically show better academic achievement (Fitriani et al., 2020; Alsarayreh, 2021).

The average analytical ability achievement of senior high school students in Palembang City is included in the sufficient category (44.24%) (Table 5) which includes two concepts, namely the concept of respiration and circulation. The average student achievement in the respiratory system is 62.89% in the "good" category (Table 3), while for the material in the circulatory system it only reaches 25.59% "enough" (Table 4). Material studies carried out on the circulatory system show that the material for the circulatory system has a broad and more in-depth coverage of material compared to the material for the respiratory system. In addition, in the material of the circulatory system there are still a lot of misconceptions when compared to misconceptions

that occur in the respiratory system (Rohmadhani et al., 2021; Bordes et al., 2020; Vitharana, 2021; Izza et al., 2021). The results of research conducted by Khairaty et al. (2018) explained that the findings of many misconceptions in the circulation system material were caused by the lack of student interest in the lesson, the number of scientific terms encountered, the tendency of students who were accustomed to memorizing, teacher-centered learning, there was no teacher confirmation to students about concepts that were lacking, understood, and the lack of learning resources.

**Table 3 The results of the analysis ability achievements of high school students in Palembang on the respiration system material**

| No.         | Correct answers | Percentages % |
|-------------|-----------------|---------------|
| 1           | 255             | 61,9          |
| 2           | 377             | 91,5          |
| 3           | 313             | 76            |
| 4           | 174             | 42,2          |
| 5           | 52              | 12,6          |
| 6           | 356             | 86,4          |
| 7           | 141             | 34,2          |
| 8           | 284             | 68,9          |
| 9           | 380             | 92,2          |
| Average (%) |                 | 62,89         |

**Table 4 Results of the analytical ability of high school students in Palembang on the circulation system material**

| No.                | Correct answers | Percentages (%) |
|--------------------|-----------------|-----------------|
| 10                 | 102             | 24,8            |
| 11                 | 81              | 19,7            |
| 12                 | 219             | 53,2            |
| 13                 | 103             | 25              |
| 14                 | 43              | 10,4            |
| 15                 | 60              | 14,6            |
| 16                 | 223             | 54,1            |
| 17                 | 127             | 30,8            |
| 18                 | 47              | 11,4            |
| 19                 | 83              | 20,1            |
| 20                 | 88              | 21,4            |
| 21                 | 93              | 22,6            |
| 22                 | 54              | 13,1            |
| 23                 | 108             | 26,2            |
| 24                 | 64              | 15,2            |
| 25                 | 192             | 46,4            |
| <b>Average (%)</b> |                 | <b>25,59</b>    |

**Table 5 Average achievement of high school student analysis skills in Palembang City**

|                    | Respiration   | Circulation |
|--------------------|---------------|-------------|
| <b>Achievement</b> | 62,89%        | 25,59%      |
| <b>Average</b>     | <b>44,24%</b> |             |

Based on the results of student achievements for all the questions that have been tested, it is known that the highest and lowest achievements are seen in the concept of respiration, namely in question number 9 (highest) and question number 5 (lowest) (Table 3.). As many as 92.2% of students showed very good conceptual analysis skills on question number 9 with the topic of smoking habits and only 12.6% of students could answer correctly for question number 5 (topic: implementation of the respiratory system experiment).

The high analytical ability of students on the topic of smoking habits is caused because the problems raised in this question are very contextual and are often encountered by students in everyday life. Students have been able to provide suggestions based on the problems given. Contextual problem-based learning has been recognized for a long time to make it easier for students to understand the concepts being studied. Contextual learning encourages students to improve, expand, and apply their knowledge and skills to be used in everyday life (Bustami et al., 2018). The evaluation carried out on a contextual basis has also been carried out by Stanisavjevic et al. (2016). The results of this study indicate that the contextual-based evaluation carried out shows good results for students.

The lowest achievement can be seen in question number 5 regarding the implementation

of the respiratory system experiment. These results indicate that the analytical ability of students in identifying experiments is still very low because students are not accustomed to conducting experiments at school even though it is only a simple experiment. The frequency of carrying out activities in the laboratory is still low (Handayani, 2018). This is caused by many factors, including the ability of teachers to carry out practical activities that are still inadequate, laboratory personnel are not yet available, or the quality is inadequate, facilities and infrastructure are still lacking (Susilo & Amirullah, 2018).

Concept analysis ability of students at Ilir Barat 1 Palembang is still categorized as sufficient. This is because the learning process is teacher-oriented and has not maximized student activity. The use of appropriate learning methods, approaches, and learning media can improve students' conceptual analysis skills. Activities such as designing and carrying out experiments encourage students to apply the concepts they understand. In addition, the low ability of students' concept analysis can also be caused by students who are not trained to solve analytical problems. The results of this study also show that students find it easier to solve contextual analysis questions. This is because contextual topics are closer to phenomena that occur in daily life.

## D. Conclusion

The concept analysis ability of students in Ilir Barat 1 Palembang is categorized as "enough" achievement (44.24%). The ability to analyze the concept of the respiratory system is better than the achievement of concept analysis in the circulatory system. The difficulty of conceptual analysis in the circulatory system is caused by the depth of the material that differs from the respiratory system, and the biological terms often found. The achievement of each item shows the highest and lowest achievement seen in the respiration system material. The highest achievement occurred on the topic of disorders of the respiratory system (question number 9), namely smoking. While the lowest achievement occurred on the topic of respiration mechanism implemented in the experiment (question number 5). The low achievement in problem number 5 shows that the implementation of practicum activities carried out in schools is not enough to increase student understanding.

## E. References

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