

Analysis of Students' Critical Thinking Skills on Digestive System Materials for Class XI Science at Muhammadiyah High Schools throughout Palembang City

by Sulton Nawawi, Sri Wardhani Eka Sari Rahmadani

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*“New Challenges and Strategies in Innovations
of Education and Research in the New Normal Era”*



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PREFACE

This 1st International Education Conference (IEC) 2021: New Challenges and Strategies in Innovations of Education and Research in the New Normal Era, held in Faculty of Tarbiyah and Teaching Training, State Islamic University of Raden Fatah Palembang Indonesia. The theme of this seminar adapts to current and future conditions faced by the world of education where technology plays a role in education. However, technology still cannot replace the role of teachers, lecturers, and learning interactions between students and teachers because education is not just getting knowledge but also about values, cooperation, and competence. Pandemic situation This is a challenge for each individual's creativity in using technology to develop the world of education.

IEC 2021 proceeding span over created 10 topic, which are well balanced in content and create an adequate discussion space for trendy topic. IEC 2021 hosted contributions on science education, mathematic education, digital technology in education, online teaching and learning practices, religious education, management education, early childhood education, methodologist assesment, curriculum and pedagogy, education and learning in elementaru school. There were 50 oral presentation which brought great opportunity to share their recent works knowledge among each other graciously.

We are very grateful to the commite, student volunteers who selflessly contributed to the succes of this conference. Also we are thankful to all the author who submitted papers, because of which conference became a story of succes.

Palembang, September 2021
Prof. Dr. Abdulg_hlah, M.Ed
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Analysis of Students' Critical Thinking Skills on Digestive System Materials for Class XI Science at Muhammadiyah High Schools throughout Palembang City

Sulton Nawawi^{1*}, Sri Wardhani², and Eka Sari Rahmadani³

^{1,2,3}Pendidikan Biologi, FKIP Universitas Muhammadiyah Palembang, Jl. Jend. A. Yani, Seberang Ulu II, Palembang, Indonesia

[*sulton.bio@gmail.com](mailto:sulton.bio@gmail.com)

Abstract. This study aims to determine students' critical thinking skills on the digestive system class XI IPA material at Muhammadiyah high schools throughout Palembang. The research method uses descriptive quantitative. The research population was all Muhammadiyah high schools in Palembang; the research samples were Muhammadiyah 1 Palembang high school, Muhammadiyah 2 Palembang high school, and Muhammadiyah 6 Palembang high school. The research instrument was in the form of multiple-choice test questions totalling 20 critical thinking questions on the digestive system material, questionnaire sheet, observation sheet & interview sheet. Data analysis used validity, reliability, level of difficulty and discriminating power. The results obtained that the average test scores for critical thinking skills in the digestive system material were SMA Muhammadiyah 1 Palembang of 35.42%, SMA Muhammadiyah 2 Palembang of 31.45%, and SMA Muhammadiyah 6 Palembang of 32.37%. From the three SMA, Muhammadiyah Palembang obtained an overall average of 44.33%, categorized as very low. Students' critical thinking skills on the digestive system material for class XI, IPA at Muhammadiyah high schools throughout the city of Palembang, are in the low category

1. Introduction

Education is one aspect that reflects the welfare of a country. In the development of a country, the quality of education is one of the benchmarks for the country's progress. Education can be obtained through formal and informal channels. Education is an organized, planned and continuous effort (continuous throughout life) towards fostering students to become complete, mature and civilized (civilized) [1].

Continuous and planned education cannot be separated from how the learning process takes place. Learning is the interaction of students with teachers and learning resources in a learning environment system. The learning environment consists of objectives, learning materials, strategies, tools, students and teachers. The learning process helps students/students to develop their intellectual potential so that the main goal of learning is the effort made so that each student's intellect can develop [1].

The development of science, technology, and information in the 21st century requires human resources to think critically. Critical thinking is needed to check the truth of information to decide whether the information deserves to be accepted or rejected. In addition, students who can think critically will be able to solve problems effectively [2].

Critical thinking skills are needed by high school students, especially in the city of Palembang; this is to help and find a learning concept because to face the era of globalization, there is fierce competition between nations. A nation that can master a certain amount of knowledge, technology, and skills will be the winner. The higher-order thinking ability of students in Indonesia is still relatively low. This is based on the results of a study by international institutions from the Program for International Student Assessment (PISA), in 2012 with the theme "Evaluating School Systems to Improve Education", which was ranked 64th out of 65 countries. Based on these empirical data, efforts to improve the quality of the learning process should be carried out as early as possible by abandoning the habit of classical learning processes, which tend to facilitate student understanding. The importance of students' thinking skills in the learning process greatly affects students' cognitive, affective and psychomotor development in attitudes, making decisions, and ways of solving problems both individually and in groups [3].

4 According to [4] critical thinking is a directed and clear process used in mental activities such as solving problems, making decisions, persuading, analyzing assumptions, and conducting scientific research. According to [5] developing critical thinking requires finding patterns, compiling explanations, making hypotheses, generalizing, and documenting findings with evidence [6].

Students must possess the ability to think critically. Critical thinking is a cognitive skill that can be developed through a planned learning process [7]. Ennis argues that critical thinking is reasoned and reflective thinking with an emphasis on making decisions about what to believe or do [3].

Students need critical thinking skills in studying biology. This is inseparable from the problems in biological science, which are developed through the ability to think analytically, inductively, and deductively to solve problems related to natural events around. Biology is one of the lessons that contains studies on how to identify living and non-living things, develop biotechnology, and describe the environmental balance [3].

The low critical thinking ability of students is thought to occur due to certain factors. One of these factors is the application of conventional learning. The applied learning has not been able to facilitate students to build their critical thinking. Students, in general, are only able to answer questions that match the examples and will have difficulty if the questions given are different. This happens because, in learning, teachers tend to dominate learning and students are not directly involved in critical thinking. Therefore, the learning concepts obtained from the teacher do not last long in the students' memories [1].

At this time, students tend to sit quietly listening without developing the information obtained or discussed. Students have critical thinking skills in learning such as questioning skills, hypotheses, classification, observation and interpretation. However, these skills sometimes do not develop well; it is necessary to have alternative methods that can develop students' critical thinking skills in learning biology [8].

Meanwhile, those critical thinking skills are the first step that students must have to achieve goals; it is necessary to make an effort to find solutions to these problems. If students' understanding is left low, then learning objectives will be difficult to implement. Another impact that will arise is the lack of student interest in studying Biology subjects. This, of course, will hinder the process of developing Biology subjects in the future [8].

The success or failure of the learning objectives is to assess the abilities obtained after the learning is carried out. Critical thinking is one of the abilities that can be used to indicate the achievement of learning objectives. Critical thinking allows students to be able to evaluate questions or opinions of others. The purpose of critical thinking is to achieve a deep understanding [9].

According to Ennis, there are 5 critical thinking skills (1) providing simple explanations (2) building basic skills (3) concluding (4) providing further explanations and (5) managing strategies and tactics [1].

7 According to Ennis, there are five critical thinking skills (1) providing simple explanations, (2) building basic skills, (3) concluding, (4) providing further explanations and (5) managing strategies and tactics [3].

According to Suparman, the initial ability is the knowledge and skills that students have to follow the lesson well. In addition, Winkel argues that initial abilities are a bridge to get to the final abilities, wherein each learning process has its starting point or stems from the initial abilities of certain students to be developed into new abilities, each of which is the goal in the learning process [3].

Based on the initial needs analysis that has been carried out in three Muhammadiyah Palembang high schools that are accredited A, namely Muhammadiyah 1 Palembang High School, Muhammadiyah 2 Palembang High School, Muhammadiyah 6 Palembang High School through the observation sheet, it is known that teachers have measured critical thinking skills, the skills measured are critical thinking skills. However, even though the teacher has measured critical thinking skills, it turns out that students' thinking skills are still low.

Based on the results of interviews in the form of interview sheets given to teachers at the three Muhammadiyah Palembang high schools, each teacher has a different way of measuring critical thinking skills. However, even though the teacher has measured critical thinking skills, the student's skills are still low. The teacher stated that the assessment was carried out to regulate critical thinking skills with

oral tests and essay tests, but the questions were not following critical thinking skills indicators. Therefore, the measurement of critical thinking skills cannot fully be used as a reference for the achievement of students' critical thinking skills. In addition, according to the results of interviews in the form of interview sheets given to students, it is also known that on average, students have difficulty in learning biology, namely on the material of the digestive system, even though the material on the digestive system is one of the materials that discusses problems that often occur in everyday life. However, in studying the digestive system material, the daily test scores obtained by students are relatively lower. When looking at these conditions, critical thinking is needed in solving a problem regarding the digestive system material to improve the cognitive value of students so that it can affect the quality of learning.

The form of questions used in the assessment process for learning biology is using a question form that measures the level of critical thinking, at the levels of Analysis (C4), and Synthesis (C5) and Evaluation (C6) which refers to indicators of Bloom's taxonomic thinking skills. Critical thinking is one of the skills that can make students have the ability to distinguish good and bad information and can make decisions in solving problems, analyzing facts, data and events.

Based on these problems, this research is entitled "Analysis of Students' Critical Thinking Skills on Digestive System Materials for Class XI Science at SMA Muhammadiyah in Palembang".

2. Method

This research is quantitative descriptive. The population of this research is Muhammadiyah high school in Palembang. The sample of this research is SMA Muhammadiyah 1 Palembang, SMA Muhammadiyah 2 Palembang & SMA Muhammadiyah 6 Palembang. Sampling was carried out by purposive sampling based on accredited school A at SMA Muhammadiyah in Palembang City. The research instrument was in the form of multiple-choice test questions totalling 20 critical thinking questions on the digestive system material, questionnaire sheet, observation sheet & interview sheet. Data analysis used validity, reliability, level of difficulty and discriminating power. The critical thinking ability test results for students of class XI SMA Muhammadiyah in Palembang can be categorized into several levels, which can be seen in Table 1 below.

Table 1. Category Level of Students' Critical Thinking Ability

No	Score	Information
1	0-54	Very low
2	55-64	Low
3	65-79	Moderate
4	80-89	Good
5	90-100	Excellent

[10]

3. Result and Discussion

3.1. Test Results Questions

When conducting the test activity, the researcher gave 25 questions of critical thinking about the digestive system material to the students of class XII IPA 3 and XII IPA 5 SMA Muhammadiyah 1 Palembang. Based on the validity test results, 21 questions were asked to be valid; the results of the reliability test for 25 questions were 0.77, which was categorized as high. The calculation of the difficulty level of the questions was calculated from the 25 questions; it was found that the questions categorized as easy questions consisted of 11 questions, the questions categorized as difficult 2 questions, the questions are categorized as 12 questions. As well as the results of the calculation of the differentiating power of the questions calculated from the 25 questions, it was found that the questions categorized consisted of 4 questions categorized as good, 3 questions categorized enough, 18 questions

categorized as bad, 0 questions categorized as bad.

3.2. *Test Results of Students' Critical Thinking Skills on Digestive System Material at Muhammadiyah High Schools in Palembang City*

Table 2. Test Results of Students' Critical Thinking Skills on Digestive System Material at Muhammadiyah High Schools throughout Palembang City

School Name	Score Critical Thinking Skills (%)	Category
SMA Muhammadiyah 1 Palembang	49,26	Very low
SMA Muhammadiyah 2 Palembang	23,83	Very low
SMA Muhammadiyah 6 Palembang	59,90	Low
Average	44,33	Very low

Tabel 3. Test Results of Students' Critical Thinking Skills on Digestive System Material at Muhammadiyah High Schools in Palembang City per Indicator

School Name	Interpretation (%)	Analysis (%)	Evaluation (%)	Inference (%)	Explanation (%)	Self Regulation (%)
SMA Muhammadiyah 1 Palembang	58,82	48,03	57,84	53,92	52,20	31,61
SMA Muhammadiyah 2 Palembang	45,33	33,33	44	38,66	34	25
SMA Muhammadiyah 6 Palembang	48,38	55,91	52,68	53,76	47,58	24,19
Rata-rata Per-Indikator	50,84	45,75	51,50	48,78	44,59	26,93

3.3. *Discussion*

Based on the analysis of the critical thinking questions on the digestive system material at three Muhammadiyah high schools in Palembang city, each school has different levels of critical thinking.

The level of critical thinking skills obtained at SMA Muhammadiyah 1 Palembang with a percentage of 49.26% is categorized as very low. In the learning process that occurs at SMA Muhammadiyah 1 Palembang, the teacher teaches students to participate in the material on the digestive system. However, when the teacher explained the material, there were still students who did not pay attention, did not focus on the material given by the teacher. When the teacher asks students who do not pay attention, students cannot answer the questions given.

The teacher gives questions to students to group the parts of the system, but only a few students are active in answering these questions. The teacher gives questions related to the digestive system material for students; students are led to testing ideas from the questions given by the teacher. However, when students answer questions, students still do not listen to the answers answered by other students. Then, students have to think about assessing the statements given by other students, but when other students give statements, the students do not listen to the statements; students are still talking to one another. Answering allegations of questions given by the teacher to solve a problem related to the material of the digestive system. The teacher gives problems to students to solve the problem, then looks for answers to the problems given. However, only some of the students were active in the questions the teacher had given. Students still do not listen to the answers of other students. Presenting strong opinions and daring to express their opinions regarding what has been conveyed to conclude, the teacher provides opportunities for students to express their opinions.

However, there were only a few students who actively gave the statement. Then, when students listened to the answers from other students, the answers from the students were wrong, then the other students were allowed to correct the answers that were not quite right so that they became correct. Seeing

the teacher's activities in the learning process that was carried out, the teacher only gave clear material, but only the front students were more active in answering questions than the back. Only this is also influenced by student curiosity, and student interest in learning is lacking, but there are only how many students are active in the class.

The level of critical thinking skills obtained at SMA Muhammadiyah 2 Palembang, with a total percentage of 23.83%, is categorized as very low in the learning process the teacher teaches students related to the digestive system material students to participate. This can be seen when the teacher asks questions about the material. Students are quite active, but some students are still busy with other students. When the teacher asks students to group or explain the students' material, they are quite active. The teacher tested the ideas given by questions related to the material presented, students could answer, but only a few could answer the question. When students express their opinions that are not appropriate, they provide opportunities to provide correct statements from the sources obtained. The teacher gives a question about the hypothesis about the material of the digestive system. Students are allowed to answer the conjecture, but only a few students do not pay attention to other students. Students who have given statements related to questions given by the teacher ask students to listen to whether the answer is true or false; if the answer is not correct, the teacher allows other students to justify the correct answer. When students are less able to express their opinions, other students properly argue that their statements are not quite right. This can be seen from the teacher teaching in the classroom that the teacher controls the class; students are involved in learning, but only a few students who are not active stay silent.

The level of critical thinking skills obtained at SMA Muhammadiyah 6 Palembang with 59.90% is categorized as low. In the learning process, the teacher provides material related to the digestive system material, students are involved quite actively, but there are only a few who are not active. When the teacher asks students to group or explains the material, the student can explain the material on the digestive system. However, some students were silent, listening to the statements of other students. The teacher tests the ideas given to students regarding the material. There are only some students who can answer the questions, but those cannot answer the questions. The reason for the statements submitted by students regarding the material is still lacking; there are only a few who can give reasons for the statement, some cannot. The teacher gives hypotheses or conjectures related to the material of the digestive system; students answer the hypothesis but when answering questions. The other students did not listen, so they could not answer when it was thrown at the students who did not pay attention. The teacher listens to the students' answers to see if the students' answers are correct or not. When students do not correctly answer the teacher's questions, the teacher gives to other students to correct the answers from less precise students. This means that the teacher in teaching masters the material so that it provokes students to think critically.

In general, three SMA Muhammadiyah Palembang with A accreditation, namely: SMA Muhammadiyah 1 Palembang, SMA Muhammadiyah 2 Palembang, SMA Muhammadiyah 6 were categorized as very low. This can be seen from the ability of students to answer questions about critical thinking skills. The value of critical thinking skills from the Three SMA Muhammadiyah Palembang is very low because students still talk to each other during the learning process. Students still do not care about the teacher explaining the material during the learning process. Students do not listen the teacher's explanation; when the teacher asks, the student cannot answer the question. There are only a few students who are active in the learning process. Students still lack understanding of the material of the digestive system, especially in tables and the statements contained in the questions.

Several things, including 1) cause the low critical thinking ability of students in this problem) students have difficulty in solving and answering the questions given; 2) students have difficulty in identifying when solving problems related to food substances and also the digestive process in the human system and; 3) students have difficulty in determining the disorders that occur in the digestive system so that it makes them wrong. This was also expressed by [11] Learning biology in schools has the following tendencies: 1) repetition and memorization; 2) students learn to be afraid of making mistakes; 3) not encouraging students to think creatively, and 4) rarely practice problem-solving. In addition, the evaluation of learning is still limited to the assessment only emphasizes the cognitive aspect. Meanwhile, assessing students' scientific performance tends to be ignored and not taken into account as a more meaningful alternative assessment.

5
The low thinking ability of students is because biology learning so far tends only to hone aspects of remembering and understanding [12]. Several factors also cause other factors. One of them, when students come to a class, they do not bring empty knowledge or empty minds, but they have fragmented knowledge, so students have difficulty relating concepts to one another. Students' study habits also cause critical thinking skills not to develop; students are more likely to feel comfortable with the teacher's explanation without questioning deeper.

According to [13] That critical thinking allows a person to analyze, assess, explain, and restructure his thinking. Furthermore, students ask questions to the teacher about the material that has not been understood and ask questions to the percentage group. Asking to ask for an explanation needs to be thought about because without thinking, the answers to be delivered are not by the answers that will be expected, and students have first identified a problem so that questions arise. Critical people are people who quickly identify relevant information and separate it from irrelevant information. One of the characteristics of critical thinkers is that they can use the information to formulate solutions to problems or make decisions and, if necessary, seek additional relevant information.

One of the stages to teach or train students to think critically is the skill of concluding; the reader is required to be able to describe and understand various aspects gradually to arrive at a new formula, namely a conclusion [14]. According to Seifert and Hoffnung [15] Effective critical thinking requires a person to monitor when he is trying to understand an idea, be aware of when he needs new information, and figure out how he can easily gather and learn that information.

Critical thinkers are open-minded (listening with an open mind) to opposing views or opinions and accept criticism of their beliefs and assumptions. Here, students discuss together in solving problems, giving each other their opinions [13]. Evaluating or judging skills that require the reader to assess the value measured by using certain standards [14].

4. Conclusion

The average score of the critical thinking skills test on digestive system material at Muhammadiyah High School in Palembang is 44.33%, very low. This is because student learning behaviour is very influential on student learning outcomes in the learning process.

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