

## MAPPING OF STUDENT'S CRITICAL THINKING ABILITY IN THE MATERIAL STRUCTURE AND FUNCTION OF PLANT TISSUE

Adisti Yuliastrin<sup>1\*</sup>, Dindawini Salsabilla<sup>2</sup>, Rian Vebrianto<sup>3</sup>, Mery Berlian<sup>4</sup>, and Herlinda<sup>5</sup>

<sup>1</sup>Biology Study Program, Faculty of Science and Technology Universitas Terbuka, Kepulauan Riau, Indonesia

<sup>2</sup>Tadris Science Study Program, Faculty of Tarbiyah and Teacher Training Universitas Islam Negeri Sultan Syarif Kasim, Riau, Indonesia

<sup>3</sup>Magister of Teacher Education Study Program of Madrasah Ibtidaiyah, Faculty of Tarbiyah and Teacher Training Universitas Islam Negeri Sultan Syarif Kasim, Riau, Indonesia

<sup>4</sup>Agribusiness Study Program, Faculty Science and Technology, Universitas Terbuka, Riau, Indonesia

<sup>5</sup>Magister of Islamic Economics Study Program, Faculty of Economics and Social Sciences, Universitas Islam Negeri Sultan Syarif Kasim, Riau, Indonesia

\*Email: [adisti@ecampus.ut.ac.id](mailto:adisti@ecampus.ut.ac.id)

Received: January 2, 2023. Accepted: June 19, 2023. Published: July 30, 2023

**Abstract:** In the 21st Century, students' critical thinking abilities are fundamental to facing challenges and increasing societal obstacles, especially students. This study aimed to determine the level of critical thinking abilities in SMP/MTs students. This study's significance is obtaining test results related to SMP/MTs students' critical thinking abilities. This study used a survey method involving 75 SMP/MTs students who were selected randomly. The instrument used a questionnaire containing critical thinking questions distributed online via Google Forms. The data obtained were analyzed using SPSS. Based on the survey results, it is known that the average student's critical thinking abilities are 8.0 with a good category which details can be explained as follows: 1) Providing simple explanations (8.0); 2) Building basic skills (7.9); 3) Drawing a conclusion from the data (7.5); 4) Providing further explanations (8.0); and 5) Developing a follow-up strategy (7.5). The results of this study allow a conclusion that the constructs with the highest average scores are providing simple explanations and providing further explanations with an average score of 8.0. Thus, it is recommended that students improve their critical thinking abilities and that teachers continue to use the instruments they have used.

**Keywords:** *Critical Thinking Ability, Surveys, Instrument*

### INTRODUCTION

In the 21st Century, society is faced with increasing challenges, especially for students. These days and dates, students must not only have cognitive skills. Still, they must also have 21st-century skills [1], such as communication, adaptability, interpersonal, self-management, and rational thinking skills [2-3].

Indonesian education must be able to prepare students with 21st-century skills because to face the 21st Century is part of education that should produce competent and qualified students [4], [5]. In the 21st Century, every human resource is required to be able to master various kinds of skills, one of which is critical thinking [6]. Everyone must have the ability to think critically. Everyone has different intelligence according to the potential they have [7]. In Indonesia, a person is considered intelligent if they are successful in their education [8]. Improving thinking skills is a way to produce citizens who are critical, creative, competent, and responsible for the state [9]. If education in a country does not support the development of thinking, it is considered not comprehensive. Therefore, a good education system must be able to make a person thinks rationally and has universal intelligence standards so that it becomes the basis of an educated society [10-11].

Improving critical thinking abilities is fundamental in the world of education, especially in the learning process, and developing students'

thinking skills is one of the demands of the global era [12-13]. The process of developing students' thinking skills in accordance with the 21st Century demands the development of competitiveness that focuses on students' thinking skills, which are abilities that must be mastered in this global era [14]. A person who has mastered critical thinking will be more confident in solving problems. Critical thinking can be interpreted as a cognitive activity in processing information by evaluating ideas systematically and from different perspectives [15]. Therefore, mastering critical thinking abilities is very important for students [16].

Critical thinking abilities are individual skills in using their thinking processes in analyzing arguments and providing views based on their perceptions [17]. Critical thinking is a necessity for everyone in the 21st-century education world, as rote memorization is not enough for today's learning. Someone with good critical thinking abilities can participate in science [18]. In line, someone will find it difficult to compete in the global world unless they have sufficient critical thinking [19]. By providing critical thinking abilities in class, students are expected to be able to solve problems innovatively and systematically and find solutions to these problems. These abilities allow students to analyze their opinions and draw conclusions [20]. Critical thinking abilities are very important to be demonstrated at all levels of education. This is in line with the Indonesian curriculum, namely the 2013

curriculum. The 2013 curriculum requires students to have critical thinking abilities (HOTS) [21]. Therefore, the teacher, as a facilitator in the classroom who interacts directly with students, must be able to create a learning environment that can encourage students to think critically [22].

Based on the results of previous research, the indicators of critical thinking abilities possessed by students in science learning have an achievement of 32.5%, which is classified as a low category [23]. The results of a study conducted by Khairunnisa (2021) also show that the critical thinking abilities of class IX students of SMPN 3 Paringin are still low, which is indicated by the results of students' critical thinking abilities tests [24]. The low students' critical thinking abilities are due to several factors, including the fact that students are not used to being trained on indicators of critical thinking abilities; there is still a lack of applied learning in improving students' abilities to think critically [25].

Developing critical thinking can be done not only through learning but also through assessment and practice that reflects the criteria for critical thinking [26]. To implement teaching materials in education, researchers developed an instrument in the form of an online questionnaire, namely via Google Forms, to test students' critical thinking abilities, where critical thinking abilities are 21st-century skills that, if owned by students, can improve their achievement [27-29]. Therefore, this study aimed to measure students' critical thinking abilities. Consequently, the significance of this study is to find out the level of students' critical thinking abilities

## RESEARCH METHODS

The mapping model for critical thinking abilities in this study used a survey method [30-31]. Several steps must be carried out in the survey method, including identifying research problems,

developing survey designs, developing survey instruments, selecting samples, conducting pre-tests, collecting data, editing data, coding data, entering data, processing and analyzing data, interpreting data, and drawing conclusions and recommendations [32-34].

The critical thinking ability test instrument developed consisted of 9 questions in the form of a description/essay where each construct consists of 1-2 questions. The constructs include providing simple explanations, building basic skills, drawing a conclusion from the data, providing further explanations, and developing a follow-up strategy. Each question has an answer that is adjusted to the student's opinion but still related to the structure and function of plant tissue material.

The instrument used was developed by researchers and assessed by experts. It is known that the instrument is valid and reliable, with a Richardson 20 Kuder score of 0.8 [35-36]. Data were collected from a questionnaire distributed online to students via Google Forms. The data obtained were analyzed using Anatest and SPSS Version 23.00 for Windows. Data collection was carried out between October 2022 and December 2022. The research subjects in this study involved 75 SMP/MTs (junior high school) students. The information needed to examine the elements affecting the level of knowledge was found through questionnaires and interviews.

## RESULT AND DISCUSSION

### Research Subject

This study involved 75 SMP/MTs (junior high school) students in Pekanbaru. The data obtained were analyzed descriptively to produce profiles of the research subjects. The data from research subjects are described in the following.

Table 1. Data of Research Subject

Data of Subjects	Category	N	Percentage
Gender	Male	28	37.33%
	Female	47	62.67%
Status	University Student	0	0%
	Student	75	100%
Class	8	75	100%
Ethnicity	Manganese	30	40%
	Malays	18	24%
	Javanese	15	20%
Data of Subjects	Batak	12	16%

Based on Table 1, the number of research subjects was 75 SMP/MTs students consisting of 28 male students and 47 female students of 4 ethnic groups, namely, Minangnese, Malays, Javanese, and Batak. The majority of students are Minangnese, with a total of 30 people (40%).

### Instrument Development

In this study, a survey method was used for assessment in the preparation and development of a critical thinking ability instrument [37]. The initial step in this study was to identify the research problem. Based on a study of several theories about critical thinking, five constructs of critical thinking abilities were compiled, namely, providing simple

explanations, building basic skills, drawing a conclusion from the data, providing further explanations, and developing a follow-up strategy. The following is an outline of critical thinking ability instruments.

Based on Table 2, a total of 9 items were spread into 5 constructs. After the researchers prepared the instrument outline for each construct,

the researchers then prepared the question items. After the instrument was prepared, it was submitted to the validator team for validation. The instrument was then adjusted to the existing constructs, and a trial was carried out on 75 SMP/MTs (junior high school students) to determine students' critical thinking abilities.

Table 2. Instruments for Critical Thinking

No	Construct	Question Items
1	Providing simple explanations	1,2
2	Building basic skills	3,4
3	Concluding the data	5,6
4	Providing further explanations	7
5	Developing a follow-up strategy	8,9

### Analysis

In this study, the reliability of the instrument used was analyzed, and it had a Cronbach Alpha value of 0.859. This means that the correlation coefficient is above 0.60 [38], where the instrument is appropriate for assessing critical thinking abilities. Good instrument quality is very important to ensure that the data obtained are consistent and relevant, as presented in the following Table 3.

Based on Table 3, the average good student's critical thinking ability is at least 7.5. From the data above, it can be seen that the providing simple explanation and providing further explanation constructs are the constructs that have the highest results in mapping students' critical thinking.

Critical thinking abilities are needed at this time because they can easily overcome various existing problems. Critical thinking requires clear and rational thinking [39]. There are several ways to improve students' critical thinking abilities, namely by starting with seeking inspiration from people who can think critically, be independent, work in a team, be creative, and master complex communication. Critical thinking abilities must be developed so they can affect students' good learning outcomes. Through critical thinking, students are expected to be able to learn to use their thoughts/minds as learning aids [40].

Table 3. Results of Assessment of Students' Critical Thinking Ability

Construct	N	Score	Information
Providing simple explanations	75	8.0	Good
Building basic skills	75	7.9	Good
Concluding the data	75	7.5	Good
Providing further explanations	75	8.0	Good
Developing a follow-up strategy	75	7.5	Good

### CONCLUSION

The results and discussion of this study allow a conclusion that the instruments used are five constructs, including providing simple explanations, building basic skills, drawing a conclusion from the data, providing further explanations, and developing a follow-up strategy. Based on the survey results, it is known that the number of research subjects was 75 SMP/MTs students consisting of 28 male students and 47 female students of 4 ethnic groups, namely, Minangnese, Malays, Javanese, and Batak. Based on the survey results, it is also known that the average student's critical thinking abilities are 8.0, with a good category. It is recommended that students improve their critical thinking abilities in learning so they can get maximum performance to face the challenges of the 21st Century. Consequently, it is recommended that teachers be more innovative and

creative in the learning process to improve their students' critical thinking abilities.

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