



## Critical Thinking Skills of High School Students in Biology Learning on the Concept of Structure and Function of Plant Tissues

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### ABSTRACT

One of the problems faced in education in the 21st century is the critical thinking skills of students who are still considered lacking. One of the learning tools that need to be improved to help improve students' critical thinking skills is the Student Worksheet (LKPD). This study aims to describe the effectiveness of LKPD on the concept of Structure and Function of Plant Tissue Based on Critical Thinking Skills. The validation subjects were 3 experts, individual test subjects were 3 high school class XI students and small group test subjects were 6 class XI high school students. This type of research is development research to produce valid, practical, and effective products. The results showed that the effectiveness of LKPD expectations based on the assessment of students' critical thinking skills in working on LKPD had both categories (including interpretation, analysis, inference, and explanation) and very good categories (including self-regulation). Interpersonal skills (collaborating) and intrapersonal skills (meticulous) students have very good categories.

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### A. Introduction

Education in Indonesia also follows the rules in the 21st century. What is most noticeable is that education in the 21st century is more emphasized on the existence of technology. Besides, NRC (2011) states that three skills in the 21st century must be improved, namely; 1) Cognitive skills in the form of critical thinking skills, problem-solving skills, and system thinking skills; 2) Interpersonal skills are social skills possessed by each individual in the form of teamwork skills, skills using technology (ICT), complex communication skills, 3) Intrapersonal skills are skills that exist within each individual (attitude) in the

form of management skills self and time, self-regulation, self-development, and adaptability. Following up on this, regarding the three skills required to be improved, especially in cognitive skills in the form of critical thinking skills of students, the government issued a new curriculum that is the 2013 curriculum which was implemented in stages starting in 2014 in which there are new learning models that can help the process of critical thinking skills.

One of the learning tools that can help improve students' critical thinking skills in the learning process is the Student Worksheet



(LKPD). After conducting a literature study related to LKPD, several statements were obtained regarding the development of LKPD that are currently circulating that have not been able to stimulate students' critical thinking skills, LKPD circulating only in the form of brief entries, review of learning materials, and some questions only fill in the "points period" with words or short sentences.

This statement was supported by previous researchers (Nabila, 2019; Suryawati, et al., 2017; Majid & Rocman., 2015; Sari, et al., 2016; Anggraini et al., 2016). In this regard, it is necessary to make improvements regarding the current LKPD to explore students' critical thinking skills. One way is to adopt the Facione model. Not only that, but the structure must also be following the applicable structure (Daryanto & Dwicahyono., 2014). Student Worksheets obtained through development research are LKPD that have gone through stages of improvement through micro cycles to produce a prototype (Tessmer, 1993). The final product of development is expected to have valid, practical, and effective criteria (Plomp & Nieveen, 2007).

The choice of the concept of Plant Tissue is due primarily to this concept being taught in the odd semester following the time of research, and the lack of LKPD research development on the concept so the researchers took the initiative to research the concept of Plant Tissues. Besides, the concept of this Plant Tissue needs to be raised because it is a basic concept of material related to plants so that students' critical thinking skills need to be trained.

This research was conducted at SMAN 6 Banjarmasin, because there are many types of plants both dicotyledonous and monocotyledonous that can be used as practicum material in LKPD, and there are tools that support such as microscopes, preparations to become plant tissue as a comparison and other tools as well as according to narrations from the wrong one biology teacher at SMAN 6 Banjarmasin, learning tools especially LKPD there still lacked critical thinking skills of students because they were only in the form of short answer questions and there were several essay questions whose demands were still at the mentioning stage and rarely practiced, the

learning process was often only conveyed with the concept.

Also, school licensing tends to be easier, because there is a contact person, a biology teacher at SMAN 6 Banjarmasin, who can help to license to conduct research there. Based on the above reasons, it is necessary to research the Critical Thinking Skills of High School Students in Biological Learning on the Concept of Structure and Function of Plant Tissues to describe the effectiveness of the expectations of the development worksheet.

## **B. Materials and Methods**

This research uses education design research type or Educational Design Research (EDR) and uses Formative Evaluation design Tessmer which includes several stages, namely the expert test phase, individual test, and small group test. The subjects of the study were small group tests, namely six students of class XI. MIPA 2 SMAN 6 Banjarmasin.

This research is more directed to improve the LKPD that has been circulating to become LKPD that should / is desirable. There is five LKPD origins which is being repaired. Previously analysed the weaknesses and strengths of each LKPD. After the analysis is conducted, the researcher starts to create a new LKPD based on the Facione model in which there are six skills (interpretation, analysis, evaluation, inference, explanation, and self-regulation) and refers to the LKPD systematics according to Daryanto & Dwicahyono (2014). In this study, only the small group test is intended to determine the effectiveness of the LKPD's expectations.

Data collection instruments are using the effectiveness of expectations instruments. Also, an assessment of interpersonal (collaborative) and intrapersonal (meticulous) skills was done by filling the table on the interpersonal and intrapersonal skills sheet which was performed by one observer during a small group test.

Data collection techniques in small group tests carried out by way of students answering the tasks in the LKPD through LP (Assessment Sheet) individually. The data analysis technique is done by calculating the total score obtained divided by the maximum score, then multiplied by 100%, then concluded with the categories 75.01 - 100.00% (very good), 50.01 - 75.00% (good),



25.01 - 50.00% (good enough), 00.00 - 25.00% (not good).

### C. Results and Discussion

Student Worksheet (LKPD) resulting from the development of the concept of structure and function of plant tissues produces five topics

namely (1) Meristem Tissue; (2) Permanent Tissues (Adult); (3) Organs in Plants; (4) Monocotyledonous and Dicotyledonous Plants; (5) Tissue Culture. The results of research on the development of LKPD from the results of the effectiveness of expectations can be seen in table 1.

**Table 1 Average Expectancy Results Effectiveness**

No	Skill	Max Score	LKPD To					Average	Score (%)	Category
			I	II	III	IV	V			
1	Interpretation	14	-	-	-	10,50	-	10,50	75,00	Good
2	Analysis	10	6,17	10,00	7,72	5,00	-	7,22	72,20	Good
3	Inference	24	-	20,00	-	5,00	-	12,50	52,08	Good
4	Explanation	20	12,50	-	-	-	8,11	10,31	51,55	Good
5	Self Regulation	12	10,00	9,17	10,00	10,00	10,00	9,83	81,97	Very Good

Information:

- Categories 75.01 - 100.00% (very good), 50.01 - 75.00% (good), 25.01 - 50.00% (good enough), 00.00 - 25.00% (not good) adapted from Akbar & Sriwiyana (2010).
- LKPD I = Meristem Tissue, LKPD II = Permanent Tissue (Adult), LKPD III = Organs in Plants, LKPD IV = Monocotyledons and Dicotyledons, LKPD V = Tissue Culture.

Based on the effectiveness of expectations test, the effectiveness of expectations results obtained with both categories for the skills of interpretation, analysis, inference, and explanation, while for self-regulation skills obtained results with a

very good category. In addition to measuring students' critical thinking skills, a small group test also evaluates interpersonal and intrapersonal skills, which are summarized in table 2.

**Table 2 Summary of Interpersonal and Intrapersonal Skills Results**

No	Name	Recapitulation Interpersonal Skills(%)	Category	Recapitulation Intrapersonal Skills(%)	Category
1.	Rahma	88,00	Very Good	88,00	Very Good
2.	Mulia	88,00	Very Good	77,00	Very Good
3.	Dyedel	88,00	Very Good	77,00	Very Good
4.	Maul	77,00	Very Good	77,00	Very Good
5.	Najmi	77,00	Very Good	77,00	Very Good
6.	Sarmila	88,00	Very Good	88,00	Very Good
Average		84,33	Very Good	80,67	Very Good

Information:

Categories 75.01-100.00% is very good, 50.01-75.00% is good, 25.01-50.00% is good enough, 00.00-25.00% is not good (adapted from Akbar & Sriwiyana, 2010).

The results of the interpersonal and intrapersonal skills assessment of students when working on LKPD in the small group test stage found very good categories with the interpersonal skills score of 84.33% and 80.67% of the intrapersonal skills.

In this study, LKPD as a result of the development was developed to help improve critical thinking skills and as one of the learning tools that is expected to train students in developing ICT-based interpersonal skills and skills in collaboration or intrapersonal in

this case is meticulous in century education - 21. Learners Worksheet The concept of structure and function of plant tissue that is developed can help foster critical thinking skills in both categories (including interpretation, analysis, inference, and explanation) and very good categories (including self-regulation). Student Worksheets are based on Facione (1990) which this research was also conducted by previous researchers but with different



concepts (Novitayani, 2019; Faridah, 2019; Sa'diyah, 2019; Rahmina, 2019)

From the results of the study students' critical thinking skills on interpretation skills of 75.00% (good), analysis of 72.20% (good), inference of 52.08 (good), expansion of 51.55% (good), and self-regulation of 81.97% (very good). From the results table of the effectiveness of expectations, there is a skill score that is quite far away with a maximum score per skill. This is because the answers of the six students in LKPD IV question number 1 are many that do not match the answer key or expected answers. In this case, no further action is taken because this research is only up to a small group test, but if one day this research is continued to the field test stage, a revision of the problem will be carried out. The reason why the researcher did not proceed to the field test stage was that the researcher was constrained by time and money.

In addition to assessing students' critical thinking skills, and assessment of interpersonal skills in this study was taken as collaborative skills which included five aspects, namely division of labor, unselfishness, ways of solving problems, tolerance and motivation while intrapersonal skills in this study were meticulous which included three aspects, namely doing each stage correctly, doing all stages correctly and working on time. Based on the research results, it is known that interpersonal skills (collaborating) and intrapersonal skills (meticulous) students have very good categories with interpersonal skills scores of 84.33% and intrapersonal skills 80.67%. This shows that LKPD developed not only improves students' critical thinking skills but also can improve interpersonal and intrapersonal skills.

As it is known that in this 21st century, three skills need to be developed in learning, namely cognitive skills, in this case, are critical thinking skills, interpersonal skills, in this case, are collaborating and intrapersonal skills, in this case, are meticulous. This is following the results of the NRC workshop (2011) there are three focus skills of the 21st century, namely 1) Cognitive skills (non-routine problem solving, critical thinking, systems thinking); 2) Interpersonal skills (complex communication, social skills, teamwork, cultural sensitivity, diversity); 3) Intrapersonal skills (self-management, time

management, self-development, self-regulation, adaptability, and executive functions).

The above skills are interconnected and are needed by students in the learning process. One way that can be done to improve these three skills is to use LKPD, because by using LKPD students can play an active role in having the ability to solve the problems they face. The statement agrees with Astuti (2017) in Novitayani (2019) which suggests that students can play an active role in performing critical thinking skills, one of the ways is by using LKPD where students can express their ideas and opinions in criticizing a problem. Following the objectives of LKPD according to Prastowo (2015), which is presenting tasks that can increase students' mastery of the material provided.

This study is in line with previous studies (Lestari, 2015) which reported that the so-called rigorous attitude is the scientific attitude that students have that can help them to grow students' critical thinking skills themselves. The difference is that in this study critical thinking skills were improved through a combination of inquiry and reciprocal teaching methods while in this study they were enhanced using the Facione (1990) model. In this study the concept reported is also different, namely the excretory system material, while in this study the concept of structure and function of the tissue in plants.

Other studies report that to enhance cooperation, conscientiousness, tolerance, self-confidence, and responsibility can be carried out using the guided inquiry model. Students will be involved in activities directly in finding and finding their core of the material and students are trained to be independent in solving problems that have been given by the teacher in the group. Students with a higher attitude of accuracy will try to understand the concept actively to satisfy their curiosity, which is what causes the results of the careful observation of each individual has different values. Zaini & Jumirah (2016) report the category of critical thinking skills through the development of learning tools, categorized as effective for students to use from the value of the students' answer distribution based on indicators of scientific literacy questions.

All LKPD's developed in this study already included 5 Facione critical thinking



skills but did not fulfill all the critical thinking sub-skills. Nevertheless, critical thinking skills have been represented at least by one sub-skill in each task in LKPD. Besides, researchers realize the lack of one critical thinking skill according to Facione (1990), namely evaluation. This is due to the limited ability of researchers to develop questions in the form of invoices with evaluation skills.

#### D. Conclusion

Student Worksheets have the effectiveness of expectations in both categories (including interpretation, analysis, inference, and explanation) and very good categories (including self-regulation). Interpersonal skills (collaborating) and intrapersonal skills (meticulous) students have very good categories with interpersonal skills scores 84.33% and 80.67% intrapersonal skills.

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