

Junior High School Students' Critical Thinking Ability in Biology Learning through Liveworksheet E-LKPD Based on Scientific Approach

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ABSTRACT

This study aimed to assess junior high school students' critical thinking skills in biology learning using Liveworksheet E-LKPD based on a scientific approach. Critical thinking skills assessments, teacher interviews, and student response questionnaires were used as data collection techniques. The n-gain, normality test, homogeneity test, and independent sample t-test were used to assess critical thinking skills data. The questionnaire and interview data were analyzed descriptively in percentage form. The results revealed significant differences in critical thinking skills between students in the experimental and control groups (Sig. < 0.05). The learning process and teaching materials employed produce differences in students' critical thinking skills, students are not accustomed to working on critical thinking problems, and teachers have not maximized learning activities with the scientific approach.

Kemampuan Berpikir Kritis Siswa pada Pembelajaran Biologi di Jenjang SMP Melalui Pemanfaatan E-LKPD dalam Liveworksheet Berbasis Pendekatan Saintifik

ABSTRAK: Tujuan penelitian ini adalah untuk mengetahui kemampuan berpikir kritis siswa pada pembelajaran biologi di jenjang SMP melalui pemanfaatan E-LKPD dalam liveworksheet berbasis pendekatan saintifik. Teknik pengumpulan data dilakukan dengan pemberian tes kemampuan berpikir kritis, pelaksanaan wawancara guru, dan angket tanggapan siswa. Data kemampuan berpikir kritis dianalisis dengan n-gain, uji normalitas, uji homogenitas, dan uji independen sampel t-test, sedangkan data angket dan wawancara dianalisis secara deskriptif dalam bentuk persentase. Hasil penelitian menunjukkan bahwa terdapat perbedaan kemampuan berpikir kritis yang nyata di antara siswa kelompok eksperimen dan kelompok kontrol (Sig. < 0,05). Perbedaan kemampuan berpikir kritis siswa disebabkan oleh proses pembelajaran dan bahan ajar yang digunakan serta siswa belum terbiasa mengerjakan soal-soal berpikir kritis dan guru belum mengoptimalkan kegiatan pembelajaran dengan pendekatan saintifik.

INTRODUCTION

Critical thinking is one of the skills that students must possess in the twenty-first century (Al Fanny & Roesdiana, 2020). To survive and participate in the global competition in the twenty-first century, humans must have the ability to think, one of which is the ability to think critically (Maulina, Aini, et al., 2022; Thahir et al., 2019). Education is expected to produce graduates who are not only competent in using ICT (Information and Communication Technologies) but also in critical thinking skills, problem-solving (Ridho et al., 2020; Zakhia et al., 2022), communication, collaboration, and having good character qualities in the twenty-first century (Juanda et al., 2021).

Students must think critically to solve problems, make judgments, and analyze assumptions (Suryaningsih & Dewi, 2021), (Ennis, 2011). Students are taught to use critical thinking to address problems systematically (Puspita & Dewi, 2021; Rachmantika & Wardono, 2019), to be innovative, and to design essential solutions (Sukamto et al., 2022). The scientific approach is one example of a learning technique with these features (Yuliyanto et al., 2018). A scientific approach to problem-solving learning can be used to build critical thinking skills and assist students in completing assignments based on real-world situations (Sa'diyah et al., 2021) & (Rofieq et al., 2021).

Teachers can use current developments in science, technology, and information to produce innovations in the learning process (Haka et al., 2020; Pranata & Nurhasanah, 2020), with one of the technological and information innovations believed to be generated in the learning process being the E-LKPD (Electronic student worksheet) (Amthari et al., 2021). E-LKPD is a type of electronic teaching material that can include titles, identities, study instructions, competencies to be attained, learning objectives, indicators, supporting information, activities and work

processes, observations, data analysis, or scaffolding questions to help participants learn concepts (Cipta et al., 2020), draw conclusions, and write a bibliography (Azhari & Huda, 2022). The E-LKPD that the teacher developed during the learning process can be aided using Liveworksheet (Amthari et al., 2021; Rhosyida et al., 2021). Because the teacher is in charge of implementing learning, the development of teaching materials created by the teacher during the learning process is critical. The essential importance for instructors to achieve professionalism, including growing talents, is competence in planning, implementing, and assessing learning (Komarudin et al., 2020; Maulina, Widyastuti, et al., 2022).

The subject of the interaction of living things with their surroundings is seen to be appropriate for honing students' critical thinking skills using a scientific approach (Cahyaningrum & Parmin, 2015; Romadhoni & Sugiyanto, 2017). This is because all of the topics covered in the curriculum need students to exercise analyzing and observing abilities. This is a type of critical thinking ability. The goal is to teach students how to recognize difficulties related to events and facts in their surroundings (Afandi et al., 2019) & (Likita et al., 2020). The material for the interaction of living things with their surroundings is strongly tied to daily life and the surrounding environment. It is made up of facts and phenomena that students can directly observe (Irsyad, 2014).

Based on the results of the preceding description, the author believes that a study titled "Junior High School Students' Critical Thinking Skills in Biology Learning through Liveworksheet E-LKPD Based on Scientific Approach" is necessary. This study is significant because the effect of employing the Liveworksheet E-LKPD in a scientific approach on students' critical thinking skills at SMP Negeri 45 Bandar Lampung has not been determined.

METHODS

The study occurred during the even semester of the 2021/2022 academic year at SMP Negeri 45 Bandar Lampung, specifically on Jl. Padat Karya, Kampung Bayur, Kota Bandar Lampung, Provinsi Lampung. The population in this study consisted of all seven-grade students (116 students) of SMP Negeri 45 Bandar Lampung. Purposive sampling was used in this study. Therefore the samples taken were class 7.1 as the experimental class (30 students) and class 7.3 as the control class (29 students).

The research design was quasi-experimental with a non-equivalent control group design (Creswell, 2019). The assignment of subjects to the groups in a quasi-experimental design is not done at random. Individual subjects are already in the comparison group before the investigation. Because it is hard to organize the subjects randomly, this design is quite frequent and effective in education. Researchers use it as a predetermined set of subjects (Creswell, 2019).

As illustrated in Figure 1, the research was carried out in three stages: the original stage, the implementation stage, and the final stage.



Figure 1. Research Procedure

This research collected quantifiable data by giving critical thinking ability test questions (10 description questions). The test questions were then analyzed for validity and reliability. In qualitative data collection, the researchers interviewed teachers and students (each with 15 questions).

The quantitative data analysis technique was used on the results of critical thinking skills tests. The study data was processed in the form of pretest and posttest

results. The n-Gain, normality test, homogeneity, and independent sample t-test were used to examine the data. The SPSS program was used to analyze the research data. The descriptive qualitative data, particularly the teacher interviews, were analyzed using the Miles and Huberman model. Furthermore, the student questionnaire was descriptively and qualitatively assessed in percentages.

RESULT AND DISCUSSION

Critical thinking skills tests on the interaction of living things with their surroundings yielded data on students' critical thinking s. The test was administered to students in grades 7.1 and 7.3 using a Google Form sent via the WhatsApp Group. The obtained critical thinking skills data was then processed to determine the mean, standard deviation, normality test, homogeneity test, and independent sample t-test from the experimental and control classes, as shown in Table 1.

Table 1. The Data of Pretest and Postest

Score	Clas s	N	Aver age ± SD	Normal ity	Homoge neity	T-test
Prete st	E	30	49.8 9 ± 11.8	Sig. > 0,20 0,05	Sig. 0,10 > 0,05	Sig. (2- tailed) 0,00 <
	K	29	43.7 2 ± 9.43	Sig. > 0,16 0,05		
Postt est	E	30	83.3 3 ± 9.68	Sig. > 0,20 0,05	Sig. 0,45 > 0,05	0,05 (BS)
	K	29	66.9 0 ± 11.4	Sig. > 0,08 0,05		

Table 1 shows that the mean value of students' critical thinking skills in the experimental class is higher than in the control class. From these data, the critical thinking skills scores of students in classes 7.1 and 7.3 are normally distributed and come from a population with a

homogeneous variance (Sig. >0.05). Then, an independent sample t-test was performed. The independent sample t-test aims to compare the averages of two groups that are unrelated to one another (two independent samples) to see whether the two samples have the same mean. From the independent sample t-test, there is a significant average

difference between the critical thinking skills of students in the experimental class and control classes. It can be seen from the results of the Sig. (2-tailed) < 0.05. Thus, H₀ is rejected, and H₁ is accepted. Therefore, there is a difference in the average student learning outcomes between the experimental class and the control class.

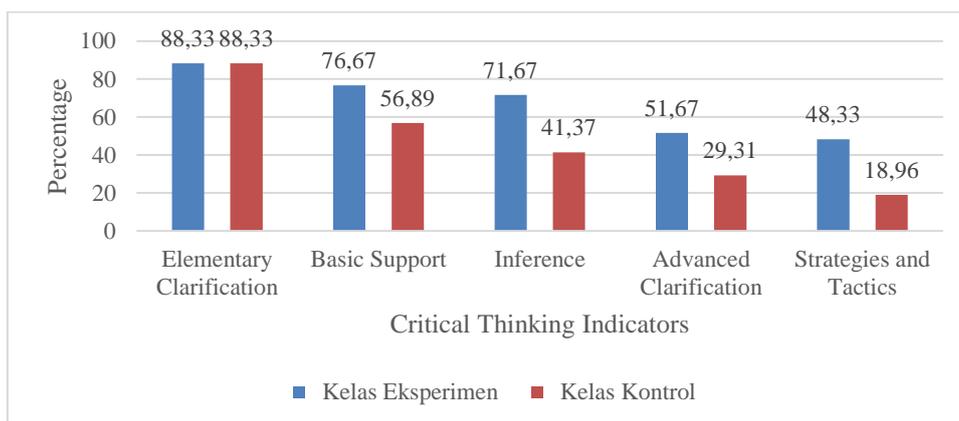


Figure 2. The Achievement of Students' Critical Thinking Skill Indicators

Figure 2 shows that the proportion of students' critical thinking skill indicators obtained in the experimental class has a larger tendency than the control class in four categories: basic support, inference, advanced clarification, and strategies and tactics. The inference indicator has the greatest percentage difference between the experimental and control classes, with a total difference of 30.3%. However, the percentage of students' critical thinking skills indicators in the elementary clarification category is the same in both classes, 88.33%.

The independent sample t-test in Table 1 reveals a significant difference in the students' critical thinking skills in the control and experimental groups. This is demonstrated by the Sig. (2-tailed) 0.00 < 0.05, which indicates that H₀ is rejected and H₁ is accepted. Figure 1 shows that the elementary clarification indicator was reached on average by SMP Negeri 45 Bandar Lampung students. They could focus the queries by comprehensively examining

arguments and clearly categorizing the ecosystem units they received. This claim is evident from the same percentages in the experimental and control groups. The similarity in these percentages is due to the two classes having homogeneous cognitive knowledge skills, so the foundation for their elementary clarification abilities is the same. Furthermore, the experimental class outperforms the control class on four indicators: basic assistance, inference, advanced clarification, and strategies and tactics.

MENGASOSIASIKAN

Tuliskan apa yang kalian peroleh dari hasil pengamatan pada tabel berikut.

Kategori Satuan Ekosistem	Nama Makhluk Hidup	Jumlah	Keterangan
<i>Contoh:</i>	Kuda Nil	1	Kuda nil masuk ke dalam kategori satuan ekosistem yaitu individu, hal tersebut dikarenakan ...
Individu	1. Biawak	1	Biawak, Burung, dan Harimau masuk ke dalam kategori satuan ekosistem yaitu individu, hal ini dikarenakan pada satu spesies makhluk hidup hanya berjumlah satu ekor saja.
	2. Burung	1	
	3. Harimau	1	
Populasi	1. Ikan	30	Ikan, Babi Hutan, Tapir, dan Monyet masuk ke dalam kategori satuan ekosistem yaitu populasi, hal ini dikarenakan dalam satu spesies makhluk hidup yang sejenis terdapat lebih dari satu atau dua individu sekumpulan spesies yang sejenis yang hidup di tempat tinggal yang sama.
	2. Babi Hutan	5	
	3. Tapir	4	
	4. Monyet	8	

Figure 3. The Sample of Students' Answers on Activity 1 of the E-LKPD

Figure 3 illustrates that when responding to questions in E-LKPD learning activities, students referred to indicators of critical thinking skills, namely elementary clarification and basic support. It is evident from the responses of students who clarified and considered the findings of observations. It will impact students' ability to answer critical thinking skills test questions by polishing their ability to answer learning activities on Liveworksheet E-LKPD based on a scientific approach.

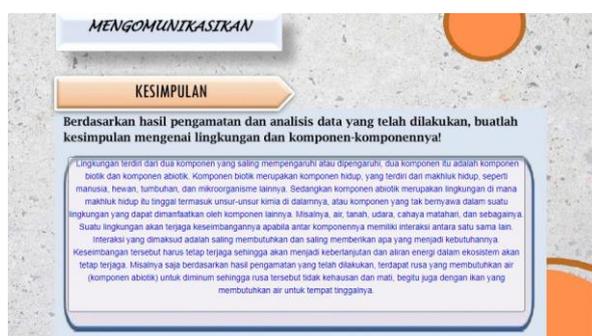


Figure 4. The Sample of Students' Answers on Activity 2 of the E-LKPD

Figure 4 illustrates that students referred to indicators of critical thinking skills, especially inference (concluding) when answering questions in E-LKPD learning activities. It is evident from students' responses who presented an explanation for a conclusion based on observations and data analysis. It will impact students' ability to answer critical thinking skills test questions by polishing their ability to answer learning activities on Liveworksheet E-LKPD based on a scientific approach.

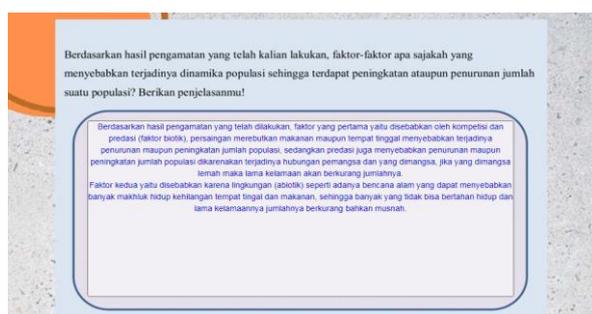


Figure 5. The Sample of Students' Answers on Activity 4 of the E-LKPD

Figure 5 illustrates that students in the population dynamics sub-material could answer questions, identify assumptions by providing further explanations, and define difficulties when participating in learning activities in the E-LKPD. Before administering the Liveworksheet E-LKPD, students' ability to answer pretest questions indicated that they did not understand the fundamental concepts of the examined sub-matter. However, by giving the Liveworksheet E-LKPD with stages of a scientific method that will help students to improve their critical thinking skills, the Liveworksheet E-LKPD itself will make it easier for students to absorb the information supplemented by engaging features. Thus, sharpening students' abilities to respond to Liveworksheet E-LKPD learning activities using a scientific manner will affect students' capacity to respond to posttest questions on critical thinking skills (Amthari et al., 2021).

Regarding the relationship between the sub-material and student achievement in answering questions based on the indicators of critical thinking skills shown in Figure 2, the sub-material of interdependence between living things and the environment and population dynamics is widely applied to indicators of critical thinking skills, namely the indicators of inference, advanced clarification, and strategies and tactics. Relatively poor mastery of basic concepts and a lack of ability to process information and ideas, combine facts and ideas to synthesize, explain, interpret, and draw conclusions, will impact achievement indicators of critical thinking skills. This finding is consistent with the findings of (Irsyad, 2014) and (Hasanah & Suyanto, 2021), which claim that there is a link between conceptual competence and the ability to think critically. A lack of conceptual mastery shows a lack of critical thinking skills. It also claims that conceptual knowledge of the subject being evaluated influences students' critical thinking skills (Ristanto et al., 2020). Students are deemed

to have high conceptual comprehension if they can answer questions of diverse forms.

The steps of the scientific approach in the experimental class are inextricably linked to numerous syntaxes in the discovery learning model, such as data gathering, data processing, and concluding (Nurdin et al., 2019). The steps of the scientific approach include watching, asking questions, and participating in activities requiring students to work hard and collaborate to collect and seek information. Students are instructed to observe and complete the tables offered in learning exercises that include context from ordinary life. Furthermore, students are directed to create questions related to the activity's topic, and they are guided so they can ask questions autonomously. Students gather data through video and image analysis in learning activities. Reasoning activities instill a sense of responsibility for the information gathered to construct reasons supported by solid evidence and discover patterns that lead to appropriate conclusions made from that knowledge. In contrast, in communication exercises, students can express their thoughts vocally and in writing as a conclusion (Ucisaputri et al., 2020).

The five stages of the scientific approach and aspects of the discovery learning syntax allow students to develop direct comprehension of their thinking frameworks and communicate knowledge or understanding. Student activities carried out in a scientific method to attain learning objectives are coherent and systematic. Thus, implementing learning activities using a scientific method can help students enhance their critical thinking skills (Bensley & Murtagh, 2012). During the learning process, students are trained to think critically in each learning activity in the experimental class utilizing the scientific approach phases provided in the Liveworksheet E-LKPD. The learning methodology in the control class is typical, employing just the group discussion method.

The use of visuals in the form of interactive images and videos as well as interesting features (Amalia & Lestyanto, 2021) such as 1) being able to include learning videos linked from YouTube; 2) inserting animations or images and backgrounds in the questions; 3) making essay questions by providing empty boxes and answering by clicking on the boxes provided then typing answers; 4) Students' answers can be corrected by circling, typing, crossing out, inking, adding lines, and commenting, and 5) The Liveworksheet E-LKPD learning exercises and questions can be reopened or re-studied, and the processing time is also variable. Features This will play a significant role in learning because it will aid students' comprehension and memory (Hume et al., 2021). The video shown in each task in the Liveworksheet E-LKPD stresses students' ability to analyze and classify. Furthermore, pictures can pique students' interest and provide insight into the relationship between academic information and the real world (Maulina, Aini et al., 2022).

Teachers can indirectly help students use their gadgets appropriately by implementing the Liveworksheet E-LKPD supported by this technology (Amthari et al., 2021; Triasari et al., 2022). This is consistent with (Hosnan, 2014), who emphasizes that working on the E-LKPD can help students develop their creativity in problem-solving. Furthermore, a study by (Syarifuddin, 2018) & (Syarifuddin, 2018) suggests that student responses to the display of the Liveworksheet E-LKPD are important in the learning process. According to the statistics, 15.4% strongly agree, 59% agree, and 7.7% disagree. Implementing the Liveworksheet E-LKPD then allowed students to remember the topics covered for a longer period. The results showed that 41% strongly agreed, 41% disagreed, and 10.3% disagreed. The Liveworksheet E-LKPD allows students to assess difficulties in everyday life that are relevant to learning science (Asmaryadi et al., 2022; Rosyidah et

al., 2020). According to student replies, 38.5% strongly agree with the statement, 51.3% agree, and 5.1% disagree.

CONCLUSION AND SUGGESTION

The study's findings indicate an effect of using the Liveworksheet E-LKPD based on a scientific approach to students' critical thinking skills, as evidenced by the Sig. (2-tailed) < 0.05 , which means that H_0 is rejected and H_1 is accepted. It indicates a significant difference between the experimental and control groups. As a suggestion, the development of the Liveworksheet E-LKPD can be used as a reference for people who want to build exciting teaching materials and drive students to enjoy studying. Of course, numerous media, applications, and websites can be produced to support the learning process by responding to the progress of the times, conditions, and current situations.

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