Volume 13 (1) 2025, 1-7

Jurnal Pelita Pendidikan

Journal of Biology Education

https://jurnal.unimed.ac.id/2012/index.php/pelita/index

eISSN: 2502-3217 pISSN: 2338-3003

IMPLEMENTATION OF LEARNING BASED ON E-WORKSHEETS WITH A SCIENTIFIC APPROACH ON THE MATERIAL OF THE DIGESTIVE SYSTEM IN CLASS XI SMA UNGGULAN AL-MANAR

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ARTICLE INFO:

Article History
Received: July 02nd, 2024
Revised: February 10st, 2025
Accepted: March 10th, 2025

Keywords:

E-worksheet, Scientific approach, Critical thinking skills

ABSTRACT

This study aims to determine the application of e-worksheet with a scientific approach in class XI IPA SMA Unggulan Al-Manar in the learning process as measured by students' critical thinking skills. The instrument for measuring the question is administered both before and after the implementation of the learning. The data analysis technique employs quantitative analysis, specifically the calculation of the average value, to assess the students' critical thinking skills. The results of the data analysis indicate that the implementation of learning using e-worksheet with a scientific approach can enhance the critical thinking skills of students in class XI IPA at SMA Unggulan Al-Manar. This is evidenced by the change in the cognitive value of students during the pretest and posttest, which fell within the very good category. The average value of students during the pretest was 54.13, while the average value increased to 86.75 during the posttest, indicating an improvement in critical thinking skills.

How to Cite:
Yenda, Azura, N., & Gultom, Endang, S. (2025). Implementation of Learning Based on E-Worksheets with A Scientific Approach on The Material of The Digestive System in Class XI SMA Unggulan Al-Manar, 13(1): 1-7.

INTRODUCTION

The 21st century requires individuals to possess a variety of skills in order to compete in the face of increasingly rapid change. These skills include critical thinking, problem-solving, and communication. The National Education Association has identified these skills as 'The 4Cs': critical thinking, creativity, communication, and collaboration (Rhedhana, 2019). The implementation of education can support students in mastering the various skills needed to meet these skill demands (Septiani et al., 2019).

One necessary skill is critical thinking. Rahman (2019) argues that students require problem-solving skills that involve critical thinking processes as the core of 21st-century learning. Critical thinking skills enable students to ask questions and provide criticism about the information they want to know, making them more active learners (Saleh, 2019). Zubaidah (2017) states that critical thinking skills are high- level thinking process skills that play a crucial role in developing moral, social, mental, cognitive, and scientific development skills.

The results of the Trends in International Mathematics and Science Study (TIMSS) indicate that Indonesian students struggle with solving questions that require contextual, demanding reasoning, argumentation, and creativity. According to Gustia's research (2021), Indonesia received a score of 396 in the science category, ranking 80th out of 88 countries. Additionally, according to a study conducted in November 2021 at Class X SMA Labschool Unesa, students' critical thinking skills were found to be at a very low level. Out of 56 students, only 54.13%, 30.36%, and 36.91% were able to provide simple explanations, analysis, and further explanation, respectively, falling into the low category (Ma'rufah and Wisanti, 2023).

The initial observation of the research was conducted by giving a test in the form of multiplechoice questions with critical thinking indicators. The test was distributed to 32 students of class XI IPA SMA Unggulan Al-Manar. The results of the initial observation showed that the percentage of critical thinking skills of students in class XI IPA was very low. The test results show that the results of students that in the elementary clarification indicator students obtained an average of 10.9% with a very low category, in the indicator of building basic support obtained an average of 18.75% with a very low category, in the inference indicator obtained an average of 24.95% with a very low category, in the advanced clarification indicator obtained an average of 14.05% with a very low category, and in the strategy and tactics indicator obtained an average of 43.7% with a low category. This shows that students' understanding of the digestive system material is not optimal. In addition, observations made in class XI IPA show that teachers rely only on textbooks as a learning resource and have not used innovative learning media

According to Liana (2020), the scientific stages can help develop critical thinking skills by providing a learning experience that achieves every indicator of critical thinking. The process of observing and questioning helps students build basic skills and train them to provide simple explanations. Additionally, gathering information and reasoning aids students in providing advanced clarification and making inferences. Similarly, the communication phase helps students develop strategies and tactics for post-learning activities and interactions. This demonstrates the practicality of using a scientific approach to train critical thinking skills in learning activities.

Students require critical thinking skills in the learning process, particularly in biology. Irawan and Pagarra (2023), argues that biology has specific material characteristics that distinguish it from other fields of science, such as the digestive system. This material may be challenging for some students as it requires an understanding of various processes related to its structure and function. According to Nawawi's (2021) study, students' critical thinking skills on the topic of the human digestive system were categorized as very low, with only 23.83% demonstrating proficiency. The study aimed to improve students' critical thinking skills and learning quality by focusing on this topic.

Developing teaching materials based on the scientific approach is an innovative way to cultivate students' critical thinking skills. According to Ma'rufah and Wisanti (2023), student worksheet can be developed as a teaching material to enhance critical thinking skills using a scientific approach. Student worksheet can assist students in

comprehending concepts through theory, investigation, or demonstration, while also providing procedures or work instructions to complete tasks in accordance with the learning indicators to be achieved (Firdaus and Wilujeng, 2018). Support and utilize 21st-century technology in Industry 4.0, student worksheet forms have been changed to student e-worksheet. Electronic student worksheets can be operated with various electronic devices, such as computers, laptops, and mobile devices, making them practical and easily accessible to students. The use of student e-worksheet in the learning process is expected to provide opportunities for students to actively participate in their learning. Furthermore, the student e-worksheet facilitates students' comprehension of learning materials beyond fundamental knowledge.

This research utilizes the Canva application in the application of electronic student worksheets. According to Melinda's (2021) research, Canva is an editor application that teachers can use to innovate learning and facilitate technology-based learning, skills, creativity, and student engagement in the learning process. According to Firmansyah's (2023) research, Canva-based student worksheets facilitate various learning modes, or learning style preferences, to create a more favorable learning environment for students. The application of Canva-based digital student worksheet in learning implementation has received positive responses from students, with over 89% rating it as good or very good. This indicates that students have a strong interest in utilizing Canva-based student worksheets as a learning tool in the classroom.

Based on this description, it is suggested that a student e-worksheet based on a scientific approach with the help of the Canva application can be used to improve the critical thinking skills of students on the material of the digestive system. The purpose of this study was to determine the application of Electronic Student Worksheets with a scientific approach in enhancing students critical thinking skill in class XI IPA SMA Unggulan Al-Manar, with a focus on digestive system material.

METHOD

The research was be conducted at SMA Unggulan Al-Manar, located at Jalan Karya Bakti No. 34, Medan Johor, North Sumatra, with poss code 20143. The research was conducted for 1 month in May 2024.

The population in this study were all students of class XI IPA SMA Unggulan Al-Manar consisting of 1 class with 40 students. The science class only consists of 1 class so class XI IPA is research sample.

The research used is descriptive research. The research activities did not use a control class, only used one class as an experimental class given treatment with e-worksheet-based learning using a scientific approach.

The independent variable in this study is e-worksheet-based biology learning with a scientific approach. While the dependent variable is the critical thinking ability of students on the material of the digestive system in class XI IPA SMA Unggulan Al-Manar in the 2023/2024 learning year.

The steps in this research consist of preparation and implementation stages. The preparation stage includes initial observations to SMA Unggulan Al-Manar, related to licensing to the school to conduct research at the school. After obtaining permission, consulting with biology teachers, observing learning activities and student learning outcomes, as well as problems that exist in biology learning. The next stage is the making of Learning Implementation Plans and research instruments that will be used in research. The research instrument was then validated to the Expert Team which was then continued by testing the XI IPA class students of SMA Unggulan Al-Manar. Before the experimental class implementation stage, a pretest was first conducted to determine the initial ability of students and a posttest was conducted at the end of the meeting to determine the ability of students after treatment. The next stage is to analyze the data from the test results and draw conclusions.

The instrument used in this study was a multiple choice learning outcome test. Multiple choice tests in the form of digestive system questions with critical thinking indicators, namely elementary clarification, basic support, inference, advanced clarification, and strategy and tactics). The test questions consisted of 20 questions with 5 options (a,b,c,d, and e). The questions are made based on the competencies achieved by the students (KD, KI, and learning objectives).

Test results as student learning outcomes are obtained by quantitative analysis, namely by calculating the average score. Learner learning test results are assessed based on scoring guidelines. The maximum expected score is 100. The calculated data will be adjusted to table 1 below:

Table 1. Achievement Criteria

Acquisition Value	Qualification
81,25 < x ≤ 100	Very High
71,5 < x ≤81,25	High
62,5 < x ≤ 71,5	Enough
43,75 < x ≤ 62,5	Low
0< x ≤ 43,75	Very Low

RESULTS AND DISCUSSION

Critical Thinking Skill

The results of this study indicate an increase in student learning outcomes on digestive system material taught using e-worksheet based on a scientific approach. The utilization of e-worksheet is employed in the instructional process through the administration of pre-test and post-tests. These tests are utilized to assess the students' initial and final abilities following the integration of e-worksheet into the learning process. The purpose of the pre-test is to determine the students' initial critical thinking abilities prior to utilizing e-worksheet. In contrast, the post-test is conducted to evaluate the students' critical thinking skills after the integration of e-worksheet into the learning process. This process will allow for the assessment of the effectiveness of e-worksheet-based learning, which employs a scientific approach, in improving students' critical thinking skills.

The mean scores on the pretest and posttests indicate that students' critical thinking abilities have improved. This conclusion can be drawn from the data presented in Table 2, in which the results from both the pretest and posttest are shown.

Table 2. Frequency of Pretest-Posttest Values

Acquisition Value Interval	Frequency		Qualification
	Pre-test	*Post-test*	
81,25 < x ≤ 100	0	35	Very High
71,5 < x ≤ 81,25	3	3	High
62,5 < x ≤ 71,5	13	2	Enough
43,75 < x ≤ 62,5	14	0	Low
0< x ≤ 43,75	10	0	Very Low

Based on table 2 shows that the value of students experienced a very significant increase, namely the pretest value of students who were mostly in the <70 range (below KKM) with a total of 37 students at the time of the posttest reduced to 2 students. At the time of the pretest, there were 3 students who scored >70 and at the time of the posttest increased to 38 students.

The level of critical thinking skills demonstrated by students in the acquisition of posttest scores was categorized as very high in 35 students (87.5%), high in 3 students (7.5%), and low in 2 students (5%). These findings align with those of Ridha *et al*. (2021), who asserted that the utilization of learning media markedly enhances the quality of student learning. Consequently, it can be posited that an e-worksheet based on a scientific approach is highly efficacious in enhancing students' critical thinking abilities.

The learning outcomes of students are enhanced as a result of the incorporation of discussion groups into the curriculum. These groups facilitate the discussion and resolution of problems in a collaborative setting, fostering interaction between group members. This is consistent with the findings of Kusuma and Silitonga (2016), which indicate that the learning outcomes of students have improved as a result of the formation of discussion groups.

Based on the pretest and posttest scores obtained, the average value of students based on critical thinking indicators can also be known.

Indicators of Critical Thinking

The findings indicated that the implementation of an e-worksheet, developed based on scientific principles, proved an effective strategy for enhancing students' competencies in the field of digestive system education. The trial process was conducted in class XI IPA at SMA Unggulan Al-Manar with a total of 40 students. The pretest and posttest results of the students were analyzed to determine the effectiveness of the e-worksheet application in the learning process in improving students' critical thinking skills. The results of the analysis of the effectiveness of the application of the e-worksheet based on critical thinking indicators are presented in Table 3 below.

Table 3. Pretest-Posttest Test of Each Indicator

No	Aspects of Critical Thinking	Indicators of Critical Thinking	Pretest	Kriteria	Posttest	Kriteria
1	Elementary clarification	Analyzing the argument	57,5%	Low	85 %	Very High
		Focusing the question	52,5%	Low	85 %	Very High
2	Basic support	Considering the credibility of a source	56,25%	Low	88,75 %	Very High
		Observe and consider the results of observations	55%	Low	91,25 %	Very High
3	Inference	Make inductions and consider the results of inductions.	50%	Low	83,75 %	Very High
		Making and considering decisions based on facts	42,5%	Very Low	85 %	Very High
4	Advanced clarification	Considering the definition	51.25%	Low	83,75 %	Very High
		Considering assumptions	60%	Low	93,75 %	Very High
5	Strategy and Tactics	Making decisions in action	57,5%	Low	86,25 %	Very High
		Problem-solving ability	58,75%	Low	85 %	Very High

The design of pretest and posttest questions utilized to assess critical thinking skills must be guided by the objective of enhancing students' critical thinking abilities. This approach enables the identification of critical thinking indicators in each individual student.

Assessment of the improvement of students' critical thinking skills refers to several indicators of critical thinking. Referring to Ennis' critical thinking indicators (in Cholilah, 2020) identifies five indicators of critical thinking ability, namely providing simple explanations, building basic skills, drawing conclusions, providing further explanations, and organizing strategies and tactics.

The indicator of providing a simple explanation, namely the focusing indicator, shows a striking improvement in students' critical thinking skills. This is evidenced by the fact that in the pretest, the average score obtained was 52.5% (low), while in the posttest, the score obtained was 85% (very high). Learners began to inquire about the methodology and reasoning behind the given problem. Liana (2020) asserts that the utilization of efficacious and relevant questions can effectively stimulate learners' interest and motivation in learning. The indicator of analyzing arguments, there was a striking increase, with a pretest score of 57.5% (low) and a posttest score of 85% (very high). During the learning process, students showed active involvement by asking questions and providing arguments related to the problem presented. This is in line with the findings of Wahono *et al.* (2022) who showed that challenging learning tools can stimulate student curiosity which leads to knowledge acquisition through questions and opinions raised.

The basic support component is divided into two categories, namely indicators of assessing the credibility of a source and indicators of observing and considering the results of observations. Indicators of considering the credibility of a source and considering the results of observations, the pretest average scores were 56.25% (low) and 55% (low), respectively, while the posttest average

scores were 88.75% (very high) and 91.25% (very high). The average score results on both indicators show an increase in students' critical thinking skills after treatment. The critical thinking e-worksheet is proven to have a positive influence on the indicators of critical thinking skills, with a visible increase compared to the results obtained before treatment. This is reinforced by Liana's research (2020), which shows that the problem-based learning process trains students in discussing, finding sources of information to strengthen arguments, and determining solutions to existing problems. Therefore, it can be postulated that students' critical thinking skills will improve through this process.

The Inference stage encompasses indicators of the induction process and an analysis of the results of induction, as well as indicators of induction actions and the determination of the results of consideration based on facts. The pretest results indicated that the participants demonstrated a low level of understanding with regard to the indicators of performing induction and considering the results of induction, with an average score of 50%. However, following the utilisation of the e-worksheet, the score increased significantly, reaching 83.75%, which indicated a very high level of understanding. Similarly, the indicator of making and determining the results of considerations based on facts reached a posttest average score of 85% (very high), while the pretest average score was 42.5% (very low). The acquisition of these scores demonstrates that e-worksheets based on the scientific approach can enhance students' critical thinking abilities. Inference activities in learning with a scientific approach represent a continuation of data or information processing activities. Once the relationship between information and patterns derived from that information has been identified, students can then draw conclusions in groups or individually (Hosnan, 2014). Those who are able to provide coherent and comprehensive conclusions about learning materials tend to demonstrate positive learning outcomes (Marlina *et al.,* 2017).

The advanced clarification of this indicator comprises two indicators: those related to definitions and those related to assumptions. The indicators related to definitions have a pretest score of 51.25% (low), while those related to assumptions have a pretest score of 83.75% (high). Following the treatment, which involved the use of e-worksheets based on a scientific approach in the learning process, the indicators related to definitions demonstrated an increase in the posttest, while those related to assumptions demonstrated a decrease. In the indicator of understanding the definition, the pretest score was 51.25% (low), and after being given treatment using e-worksheets based on the scientific approach in the learning process, the posttest average increased to 83.75% (very high). Similarly, the indicator considers the assumption of a pretest score of 60% (low) and after treatment using e-worksheets in the learning process increases to a posttest score of 93.75% (very high). Providing problems in the learning process is an effective method to motivate students to engage in critical thinking by encouraging them to delve deeper into the information presented. This learning activity instructs students on how to approach, conceptualize, and solve problems, as well as how to effectively communicate their ideas and conclusions (Ernawati *et al.,* 2021).

The indicator for the aspect of strategy and tactics, namely the indicator for decision-making and action, exhibited a mean value of 57.5% (low) during the pretest. The mean score on the posttest increased to 86.25%, indicating a high level of achievement. In contrast, the indicator for problem-solving ability exhibited a mean score of 58.75% (low) on the pretest, but demonstrated a notable improvement with a mean score of 85% (high) on the posttest. The data indicate that there has been an improvement in students' critical thinking abilities. The instructional approach involved directing students to identify solutions to problems and determine appropriate responses to address the issues at hand, thereby fostering students' critical thinking abilities. This is further supported by the findings of Azizah et al. (2018), which posit that critical thinking is a cognitive process based on factual knowledge that requires analysis of a specific issue. This process necessitates precision and accuracy in identifying and differentiating between issues, as well as the implementation of problem-solving strategies through meticulous examination and verification of the acquired information.

Conclusion

The implementation of an e-worksheet based on a scientific approach to the material of the digestive system has been demonstrated to enhance students' critical thinking abilities. This is evidenced by the significant increase in critical thinking scores the pretest and posttest results from 54.13 increased to 86.75 as evidenced by the increase in each critical thinking indicator used.

ACKNOWLEDGMENTS

Thank you to the supervisors and expert lecturers who have guided and assessed the products that have been developed in this study, as well as thanks to SMA Unggulan Al-Manar for giving permission and supporting data collection in this study.

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