



## E-Book on Ethno-conservation of Agricultural Land for Teaching Students' Critical Thinking Skills in Sidoarjo-Indonesia

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### ABSTRACT

**Objective:** This research aims to test the effectiveness of an e-book on the ethno-conservation of agricultural land in Sidoarjo for teaching students critical thinking skills in environmental conservation material. Critical thinking ability is one of the higher-order thinking skills in Bloom's taxonomy and needs to be applied in the learning process. Critical thinking skills need to be trained in students to solve problems in their environment. **Method:** The method used in this study is a one-group pre-test and post-test design with 15 students from the science program. The e-book had already undergone feasibility and practicality tests before being implemented in the learning process. The effectiveness test consisted of 5 multiple-choice questions and six essay questions tested for feasibility. Data processing was done using Ms. Excel and SPSS. **Results:** The Wilcoxon test results showed that using the e-book oriented towards the local wisdom values of Sidoarjo in environmental conservation material affects teaching students critical thinking skills. **Novelty:** The results of this research can be used as a reference for learning media integrated with local wisdom values to teach students critical thinking skills.

### INTRODUCTION

In this century, students must possess 21st-century skills known as lifelong learning. These skills are necessary for students to adapt to the rapid changes and developments in information to make accurate decisions and be productive in living their lives in the current era (Altun & Yildirim, 2023). Education in the current era demands 21st-century literacy, which involves analytical skills, reasoning, and individual cooperativity in identifying and solving problems according to their fields of interest (Kocak et al., 2022). Students are no longer required to filter knowledge and information but to construct knowledge, focusing on validating knowledge, known as higher-order thinking. Higher-order thinking skills are currently considered weak, and skills such as reasoning, which are necessary for developing critical thinking, are urgently needed and should be applied starting from school (Farias-Gaytan et al., 2023).

Based on data from the 2012 Program for International Student Assessment (PISA) survey, Indonesia's literacy score was 382, ranking 64th out of 65 countries. Teachers' questions in learning and assessments consist of 6 levels (level 1 being the lowest and level 6 being the highest) (Zhou et al., 2023). Students in Indonesia can only answer questions at level 1 and level 2, which merely require memorization and recalling of the material, thus not training their critical thinking skills (Putri, 2022). This results in students needing to be more capable of identifying problems, gathering relevant information, formulating alternative solutions, drawing conclusions, expressing opinions, and evaluating arguments (Putro & Sumardjoko, 2023). According to Widyaningsih and Yusuf (2018), students face obstacles when answering questions that require critical thinking because the textbooks they use in class are predominantly

(96.35%) filled with questions focused only on C1, C2, and C3, categorized as Lower Order Thinking Skills (LOTS). This impacts the low level of students' critical thinking skills. Students need more critical thinking skills due to their unfamiliarity with higher-order thinking Skills (HOTS) type questions.

Ulger (2018) states that critical thinking is a reflective and logical way of thinking focused on determining what to believe and do. Additionally, critical thinking involves understanding problems and proposing arguments or solutions aligned with the issues (Yüce, 2023). Several studies indicate that critical thinking plays a vital role in learning. Critical thinking significantly impacts learning abilities and is directly related to academic achievement. Critical thinking skills can enhance students' ability to relate learning material to daily life, for example, in biology education. Teaching critical thinking in the learning process must be supported by models, materials, and learning media that guide students to think critically.

Ramdani et al. (2021) state that students have been using textbooks (BSE) that are too complex, lacking in pictures, not communicative, and have relatively low-level questions, making it difficult to understand concepts and integrate them into their environment. E-books are expected to increase knowledge, strengthen students' understanding, and integrate concepts into their environment (Susanto et al., 2022). An e-book is a technology that uses computers/phones with modern facilities such as animations, zoom-in and out features, music, sound effects, text highlighting, videos, automatic translation, interactive features with characters or objects, and more (Tuah et al., 2019). E-books can be integrated as character education media by incorporating social life values or local wisdom values.

Large-scale trial results obtained an average percentage with perfect assessment criteria for developing conservation material e-books. Additionally, research by Interactive e-books integrated with socio-scientific peatland ecosystems in Central Kalimantan effectively improves learning outcomes and is practical in enhancing environmental awareness. For several materials, it has been proven that using e-books can enhance students' learning outcomes and increase interest in the learning process. In contrast, conservation materials oriented towards local wisdom still need to be developed.

In the current era, students still need to understand the value of technology, natural science, and local culture, so they lack the knowledge to appreciate the local culture around them. Consequently, local wisdom must be integrated into culturally and ethnoscience-based learning processes to balance the current era (Suprpto et al., 2021). Local wisdom can be incorporated into learning by integrating it into models, learning tools, or lesson content, which can serve as practical examples to realize the concepts taught. This can be designed as learning tools and textbooks (Hunaepi et al., 2020), as shown in Figure 1.

The integration of local wisdom values into learning media is expected not only to impact students but also to contribute to the preservation of these cultural values themselves. This will encourage students to develop a love for local culture and foster a personality that stimulates curiosity and the desire to solve problems through thinking (Hunaepi, 2020). Critical thinking skills can be taught to students, but they need to be conditioned through situational media present in their daily lives (Jatmiko et al., 2021; Neswary & Prahani, 2022; Prahani et al., 2023; Saphira et al., 2022; Saphira & Prahani, 2022). The integration aims to instill a love for local culture, stimulate curiosity, and

solve problems through thinking processes by incorporating local wisdom values into learning, with characteristics that can stimulate their motivation (Firdaus et al., 2020).

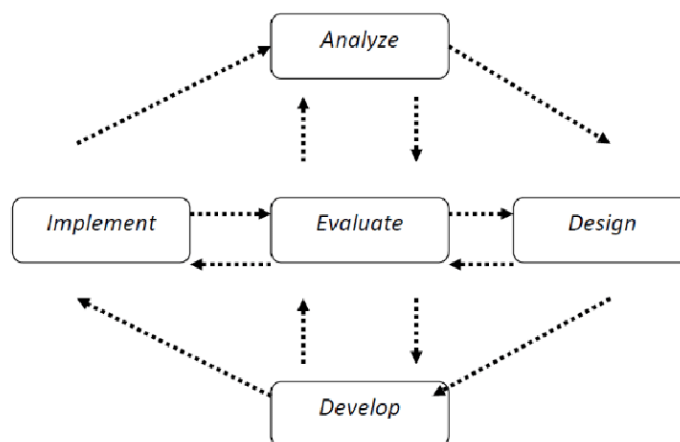


Figure 1. Integration of local wisdom into e-book learning media.

Research conducted by Muslimahayati in 2020 showed that students' critical thinking skills needed to be higher. This was indicated by the students' inability to answer high-level questions based on local wisdom values. Research conducted by Sabat et al. in 2024 demonstrated that using local wisdom can significantly enhance students' critical thinking skills in the learning process. Research by Nabila et al. 2023 stated that using the e-book "Ethno-Ecological Study of Magnoliopsida in Kiram Village" effectively trains university students' critical thinking skills. Based on the background of these issues, this study aims to describe the effectiveness of the e-book on agricultural land ethno-conservation in Sidoarjo in training students' critical thinking skills on environmental conservation topics.

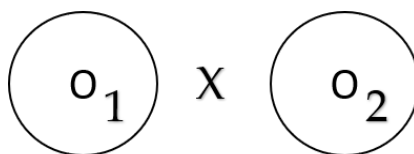
## RESEARCH METHOD

This research is based on the Research and Development (R&D) method, utilizing the ADDIE development model, which stands for Analysis, Design, Development, Implementation, and Evaluation. The ADDIE stages are systematic, clear, and easy to understand, with clearly defined and detailed procedures (Shakeel et al., 2023). The stages of the research and the outcomes produced can be seen in Figure 2.



**Figure 2.** The research scheme ADDIE model (Pratiwi et al., 2023).

This research focuses on analyzing the effectiveness of the e-book using a pre-experimental design with a One-Group Pretest-Posttest Design. This type of experimental design is used to determine the effect of treatment on the dependent variable without a control group. This design involves only one group of subjects who are given treatment and then tested with a pre-test before the treatment and a post-test after the treatment. The research design can be seen in Figure 3.



**Figure 2.** Research design.

Description:

- O<sub>1</sub> : Pre-test scores (before treatment)
- X : Application of e-book oriented to the local wisdom values of Sidoarjo to train students' critical thinking skills in environmental conservation
- O<sub>2</sub> : Post-test scores (after treatment)

The population in this study consists of 15 students from one class, namely class X-A at Islamic Senior High School of Tlasih Sidoarjo, and the sample taken is 15 students from the total population. The data collection technique in this study involves pre-test and post-test questions consisting of 5 multiple-choice questions and six essay questions, which include validated critical thinking indicators. Pre-test and post-test designs are employed to assess the impact of the treatment given (Ramdhani et al., 2024). The data analysis techniques used by the researchers include descriptive analysis, normality test, homogeneity test (not used), and hypothesis testing in the form of the Wilcoxon test using SPSS software.

## RESULTS AND DISCUSSION

### Results

The data description obtained in this study consists of numerical data derived from the pre-test and post-test results in one class. The research was conducted by administering

a pre-test and implementing an e-book oriented towards the local wisdom values of Sidoarjo to train students' critical thinking skills in environmental conservation material. Subsequently, a post-test was administered with different questions from the pre-test but with the same question indicators. The following is an explanation of the results in Table 1.

**Table 1.** Statistical description results.

	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
Pre-test results	15	57	11	68	457	30.47	18.612	346.410
Post-test Results	15	66	25	91	1101	73.40	20.787	432.114
Valid N (listwise)	15							

In this study, the respondents were 15 students from one class. Based on Table 1, the lowest pre-test score was 11, while the highest pre-test score was 68, with an overall average score of 30.47. For the post-test, the lowest score was 25, and the highest was 91, with an overall average score of 73.40. The test results were then followed by a normality test to determine if the data distribution was normal. The normality test was conducted by looking at the significance results; if the significance result is ( $>0.05$ ), the data is considered to be normally distributed, and if ( $<0.05$ ), the data is not normally distributed. The normality test results are shown in Table 2.

**Table 2.** Normality test results.

Group	Shapiro-Wilk		
	Statistic	df	Sig.
Learning outcomes			
Pre-test Results	.85	15	.01
Post-test Results	.70	15	.00

Based on Table 2, the significance value for the pre-test results of class X-A was 0.01, and the post-test results for X-A were 0.00. These data indicate that the pre-test and post-test learning outcomes are less than 0.05 ( $p < 0.05$ ), indicating that the data are not normally distributed. Therefore, the analysis continued with the non-parametric Wilcoxon test without a homogeneity test. The Wilcoxon test results are shown in Table 3 and Table 4.

**Table 3.** Wilcoxon test results 1.

	N	Mean Rank	Sum of Ranks
Post-test Results - Pre-test Results			
Negative Ranks	0 <sup>a</sup>	.00	.00
Positive Ranks	15 <sup>b</sup>	8.00	120.00
Ties	0 <sup>c</sup>		
Total	15		

a. Post-test Results < Pre-test Results

b. Post-test Results > Pre-test Results

c. Post-test Results = Pre-test Results

Table 3 shows no decrease from the pre-test to the post-test scores, as indicated by the negative rank value of 0. In the positive ranks, it was found that all 15 students tested showed an increase in their scores from pre-test to post-test, with an average increase of 8.00. The Ties result was 0, meaning there were no identical pre-test and

post-test scores among the 15 students; all scores differed. The conclusion of the Wilcoxon test results is shown in Table 4.

**Table 4.** Wilcoxon test results 2.

<b>Post-test Results X-A - Pre-test Results X-A</b>	
Z	-3.410 <sup>b</sup>
Asymp. Sig. (2-tailed)	.001

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Based on Table 4, the Asymp.Sig. (2-tailed) value was 0.001. This result indicates that the significance value is ( $<0.05$ ), meaning there is a difference between the pre-test and post-test learning outcomes. These results suggest an effect of using the e-book oriented towards the local wisdom values of Sidoarjo on environmental conservation material in training students' critical thinking skills.

### **Discussion**

The advantages of this research include using valid and practical teaching media that can train critical thinking skills, such as e-books. E-books that integrate local wisdom values can enhance attitudes, motivation, and understanding of learning material because they are relevant to the student's environment (Suwarno & Rahmatullah, 2021). Integrating local wisdom values can be a foundation for improving students' critical thinking skills and solving problems in their surroundings (Syafani & Tressyalina, 2023). Additionally, interactive e-books can significantly affect students' critical thinking abilities (Halilah et al., 2023).

Critical thinking skills in e-books can be trained through video analysis, practical simulations, graphs, and problem-based images. In this study, the e-book includes several interactive features to support students' critical thinking skills, such as the "Water of Knowledge" feature to train problem identification, the "Wind of Local Wisdom" feature to analyze problems using local wisdom, the "Earth Reading" feature to evaluate supporting readings for problem-solving, the "Earth Watching" feature to analyze problems and provide solutions, the "Critical Fire" feature to train problem-solving skills, and the "Summary Woods" feature to train argumentation related to outlined solutions. These features in the e-book can help students develop higher-order thinking skills (Nadya et al., 2023).

Critical thinking skills can be trained through understanding higher-level questions. Critical thinking questions are included in several levels, namely levels C4 (analysis), C5 (evaluation), and C6 (creation). Bloom's Taxonomy of Educational Objectives identifies evaluation, analysis, synthesis, and application as higher-order thinking skills (Bellaera et al., 2021). In the e-book with integrated local wisdom, the understanding of critical thinking questions is incorporated into the critical thinking activities within the e-book features. Students accustomed to answering higher-order thinking questions will find it more accessible, unlike those who rarely engage in such questions and need help with the analysis, evaluation, and creation stages. Students' critical thinking skills will improve as they become accustomed to working on higher-order thinking questions (Shafira et al., 2023). This improvement is evident in the increase in scores before and after the application of the e-book with integrated local wisdom (Alsaleh, 2023). Problem-based questions should reflect the reality or environment of the

students, as this can help them accurately address everyday problems (Akcaoğlu et al., 2023). Using problem-based questions can be a process towards developing critical thinking skills because it allows students to solve problems, make decisions, and learn new concepts (O'Reilly et al., 2022).

## CONCLUSION

**Fundamental Finding:** The e-book on ethno-conservation of agricultural land in Sidoarjo effectively trains students' critical thinking skills in environmental conservation. The e-book has undergone validation and feasibility testing for use in learning. Effectiveness is measured through questions that have been validated for assessing students' critical thinking skills. **Implication:** This e-book can be beneficial in training students' critical thinking skills, mainly focusing on local wisdom themes. **Limitation:** The developed e-book is limited to environmental conservation and local wisdom found in agricultural land in Sidoarjo. **Future Research:** Integrating the e-book with appropriate learning models and utilizing other biology learning materials and local wisdom relevant to those materials is necessary.

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