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Integrating Local Wisdom in E-LKPD: Enhancing Students' Critical Thinking Skills

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ABSTRACT

Purpose of the study: This study aims to develop E-LKPD based on CTL containing local wisdom of Ngawi with the help of the liveworksheet website to train students' critical thinking skills.

Methodology: The research design used by the researcher is R&D research. The development procedure used is the 4D development model (Define, Design, Develop, Disseminate). The trial subjects were class VII D, VII E, and teachers at MTs Negeri 9 Ngawi.

Main Findings: The results of the study showed that the CTL-based E-LKPD had high feasibility, with validation results from material experts of 91% (very feasible), language experts of 76.3% (feasible), and media experts of 91.7% (very feasible). Practicality tests from students and teachers showed positive responses with a very practical category (95% and 91.4%). In addition, the analysis of effectiveness based on learning outcomes showed a significant increase in critical thinking skills of students in the experimental class compared to the control class (p value <0.05).

Novelty/Originality of this study: E-LKPD integrates Ngawi's local wisdom, namely Seloondo tourism as a learning resource, so that it not only improves students' critical thinking skills, but also instills ecological awareness and local culture. In addition, the use of the Liveworksheet website makes E-LKPD more interactive, flexible, and innovative than conventional LKPD.

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1. INTRODUCTION

Education plays a vital role in shaping the quality of human resources and is a central pillar in building a nation's competitiveness. In the face of rapid global changes and technological advancements, education must not only focus on knowledge acquisition but also on fostering adaptive and critical individuals. This aligns with the vision of *Indonesia Emas 2045*, which emphasizes the development of high-quality human resources capable of mastering 21st-century skills. Among these skills, critical thinking alongside character, citizenship, creativity, communication, and collaboration (commonly known as the 6Cs) is fundamental for students to thrive in the modern world [1], [2].

In science education, particularly in Natural Science (IPA), learning is expected to promote inquiry-based approaches and the application of scientific methods. This is designed to cultivate students' critical thinking skills, enabling them to explore concepts deeply and solve problems systematically [3]. Critical thinking refers to the ability to evaluate information based on evidence and logical reasoning, thereby generating well-founded conclusions [4]. However, data from the 2022 Programme for International Student Assessment (PISA)

report highlights a worrying trend—Indonesian students' performance in science has declined, with an average score decreasing from 389 in 2018 to 383 in 2022 [5]. Locally, similar trends are seen in schools such as MTsN 9 Ngawi, where only 7.5% of students demonstrate adequate critical thinking ability [6]. This underscores the urgent need for innovative learning strategies that effectively improve students' critical thinking capacities.

One of the causes of this low performance is the dominance of teacher-centered learning approaches, which often limit student participation and discourage active engagement. In such environments, students become passive recipients of information, rarely challenged to analyze or reflect critically [7]. While various pedagogical methods have been introduced in science learning, there remains a gap in their ability to engage students meaningfully and develop their higher-order thinking skills. Addressing this issue requires innovative, student-centered strategies that bridge the gap between scientific concepts and real-world application.

One promising approach is the development of Electronic Student Worksheets (E-LKPD) based on Contextual Teaching and Learning (CTL), enriched with local wisdom content. CTL is a learning model that emphasizes connecting academic content with students' everyday lives, making learning more meaningful and relevant [8]. Johnson (2002) asserts that CTL encourages students to actively construct knowledge through observation, investigation, and reflection, all of which are essential for cultivating critical thinking [9]. Furthermore, studies such as Haka et al. (2021) demonstrate that integrating local wisdom into science education not only enhances understanding of environmental concepts but also strengthens students' cultural identity and ecological awareness [10].

In the context of Ngawi Regency, the Seloondo Nature Tourism site offers a unique ecosystem that can serve as a contextual learning resource for ecosystem material. By integrating this local ecological setting into science learning through CTL-based E-LKPD, students can better understand ecosystem interactions not just theoretically but through direct observation and engagement. This integration is especially important given the gradual erosion of local cultural values and environmental awareness among students. To support this learning model, digital platforms such as Liveworksheets offer interactive features that can enhance the quality and accessibility of learning materials. These include multimedia elements like videos, animations, visual aids, and interactive quizzes that promote numeracy literacy and increase student engagement [11]. In this study, a CTL-based E-LKPD incorporating elements of local wisdom and ecosystem material will be developed and tested for its effectiveness in improving students' critical thinking skills. The research will focus on evaluating the E-LKPD's characteristics, feasibility, practicality, and effectiveness in classroom settings.

Despite a growing body of research on CTL and the integration of local wisdom in education, there is still a notable gap in the literature regarding the use of technology-based contextual learning tools specifically designed to improve critical thinking skills in science subjects. Previous studies have focused separately on CTL, local wisdom, or digital worksheets, but rarely on the integration of all three components into a cohesive learning innovation. Moreover, studies targeting critical thinking in junior high school science learning, particularly using local contexts like Seloondo, remain limited. Therefore, this research aims to fill that gap by offering an innovative solution that combines CTL principles, digital interactivity via Liveworksheets, and local wisdom to enhance students' critical thinking on ecosystem topics.

The results of this study are expected to contribute to the development of contextual, interactive, and culturally relevant science learning tools that address both national education goals and local learning needs. This will also support the transformation of education in the digital era, aligning with the broader goals of *Merdeka Belajar* and *Indonesia Emas 2045* in creating future generations who are intellectually competent, culturally rooted, and environmentally conscious.

2. RESEARCH METHOD

The study employed a Research and Development (R&D) method using the 4D model developed by Thiagarajan et al. (1974), which includes four main stages: Define, Design, Develop, and Disseminate [12]. This model was chosen to systematically guide the development of an interactive science learning media, specifically E-LKPD, tailored for class VII students. The development process involved several steps: conducting a needs analysis, designing the media, validating it with experts, implementing limited trials, and analyzing its effectiveness [13]-[16].

In the Define stage, the researchers conducted an initial analysis to identify learning challenges, particularly the low level of students' critical thinking skills, as highlighted by the 2022 PISA results and related studies. Student analysis was also conducted to understand the characteristics and learning needs of class VII students at MTsN 9 Ngawi, especially in relation to science education. Further, a task and concept analysis was carried out to align the science topic of ecosystems with the Contextual Teaching and Learning (CTL) approach, integrating local wisdom from Seloondo tourism. Learning objectives were then formulated in accordance with the applicable curriculum and BSKAP 2022 guidelines.

During the Design stage, evaluation instruments were prepared to assess the effectiveness of the developed product. The media selected for development was E-LKPD (Electronic Student Worksheet), created

using Liveworksheets, which supports integration of text, video, audio, and interactive quizzes. The design focused on both the visual layout and content, embedding elements of local wisdom from Ngawi to enhance contextual understanding.

In the Development stage, validation was conducted by expert lecturers in the fields of material content, language, and media to ensure the feasibility of the product. The E-LKPD was characterized by the CTL approach, incorporation of local wisdom, and an interactive format via the Liveworksheet platform. The media included videos, images, animations, and quizzes to engage students. A limited trial was carried out in class VII D at MTsN 9 Ngawi to evaluate practicality and effectiveness. This was followed by a field trial where the E-LKPD was implemented in both experimental and control classes. The effectiveness was then measured using an independent sample t-test on post-test results. In the Disseminate stage, the E-LKPD was distributed on a limited scale to one school, using the WhatsApp application to facilitate access and implementation.

The data collection instruments used in this study included instruments for analyzing student needs, conducting teacher interviews, expert validation sheets, post-test question sheets, and student response questionnaires. Prior to conducting the effectiveness test, the post-test questions underwent several evaluations, including validity, reliability, difficulty, and discriminatory power tests. Additionally, the media was reviewed by expert evaluators before it proceeded to the dissemination phase.

For data analysis, several statistical techniques were employed. The normality test, using the Shapiro-Wilk method via SPSS, determined whether the data followed a normal distribution. If the significance value (Sig) was greater than 0.05, the data was considered normally distributed. The homogeneity test assessed the equality of variances, which is a prerequisite for conducting an independent sample t-test, also facilitated by SPSS. The independent sample t-test compared the learning outcomes between the experimental and control groups. Effectiveness was indicated by a t-value greater than the t-table value and a p-value less than 0.05 [17], [18]. The results of the expert assessment are converted into percentage form using the following formula [19].

$$Percentage \frac{Total\ Score}{Score\ Maximum} x100\%$$

Table 1. Level of Eligibility Based on Experts

Percentage (100%)	Criteria
81 – 100	Very Worth It
61 – 80	Worthy
41 – 60	Quite Decent
21 – 40	Not feasible
<21	Totally Unworthy

Based on the results of the t-test from both classes, it shows that the treatment in the control and experimental classes showed significant results and the use of E-LKPD media can provide a positive influence on learning. The results of the assessment of the response questionnaire given to teachers and students were classified in percentages with the following practicality criteria [20].

Table 2. Level of Media Practicality

Percentage (100%)	Criteria
80 – 100	Very Practical
66 – 79	Practical
56 – 65	Quite Practical
40 – 55	Less practical
30 – 39	Not Practical

3. RESULTS AND DISCUSSION

The use of CTL-based E-LKPD containing local wisdom of Ngawi is one of the learning media to train students' critical thinking skills. From the results of the research on the development of CTL-based E-LKPD containing local wisdom of Ngawi ecosystem material to train students' critical thinking skills using the 4D model, the following results were shown.

3.1. Define Stage

The definition stage includes an initial analysis to identify needs and determine the most appropriate research and development model for the problems faced. This process is carried out by referring to various sources, including books, journals, theses, and other documents. The initial needs analysis was carried out on

science teachers and students at MTs Negeri 9 Ngawi. In the observation activity, a critical thinking ability test was carried out on class VIID, showing an average score of 16%, so this can be categorized as low critical thinking ability of students.

Observation activities also conducted interviews with science teachers which showed that in the learning process teachers had applied various learning models that were in accordance with science materials such as discovery learning, PBL, and PjBL. However, in the learning process, there are still many students who are left behind in understanding the material so that it becomes one of the factors in the low critical thinking skills of students. In addition, the use of learning media that utilizes LKS from schools that contain little material makes it difficult for students to understand the material. Local wisdom in teaching materials not only helps students understand the concept of ecosystems directly, but also becomes a means to preserve culture and the environment through learning [21].

E-LKPD based on CTL containing local wisdom can be one of the efforts to train students' abilities. Teaching materials developed in digital form such as E-LKPD based on CTL become one of the interactive and interesting learning media for students in accordance with learning [22]. ElectronicsStudent Worksheets (ELKPD) are a learning tool that plays an important role in supporting the success of the learning process [23]. Research shows that CTL-based learning is effective in training critical thinking, because students are invited to observe, ask questions, and relate the material to everyday life [24].

3.2. Design Stage

The results of the design of E-LKPD media based on CTL containing local wisdom through stages based on reference stages such as media selection, format, and so on. The appearance of the E-LKPD design developed is as follows.

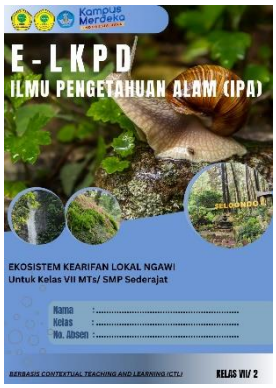

Figure 1. E-LKPD cover page

Figure 2. Theoretical basis and E-LKPD quiz

3.3. Development Stage

The E-LKPD that has been designed and developed is then assessed by media experts, language experts, and material experts as shown in the graph. The results of the product assessment by media experts are as follows:

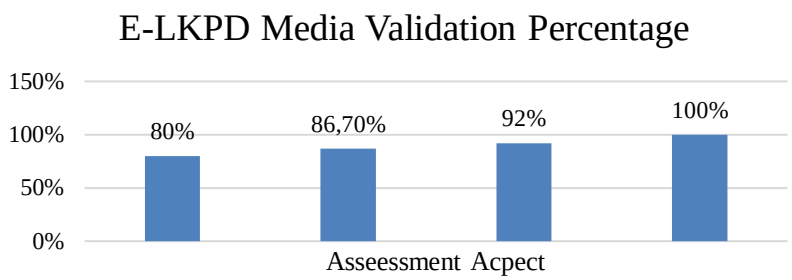

Figure 3. Media Expert Assessment Results

Based on the graphic image above, it shows the percentage of E-LKPD product assessment according to media experts. The aspects assessed include, the illustration aspect used obtained a percentage value of 80%, the category description is feasible. With the intention that the illustrations displayed on the E-LKPD are feasible to be presented and can attract students in learning. The cover page design aspect of the E-LKPD obtained a percentage of 86.70%, the category is very feasible, meaning that the page design as an identity is feasible to be presented in accordance with the contents of the E-LKPD. The page design aspect obtained a percentage value of 92% with the category very feasible to use. The ease of access aspect obtained a percentage value of 100% with the category very feasible. E-LKPD products based on CTL containing local wisdom are easy to access anywhere and anytime. Product assessment by language experts is shown in the graphic in figure 4.

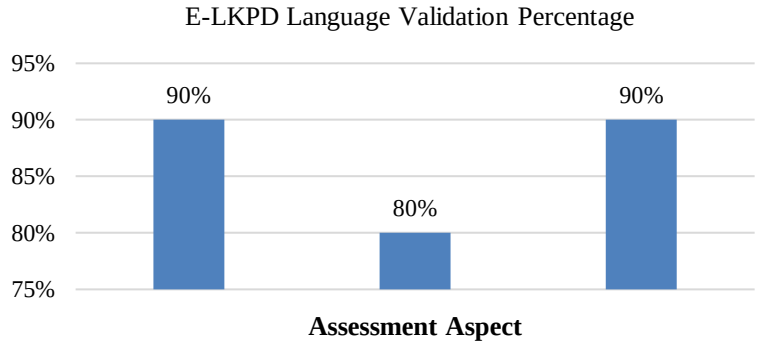

Figure 4. Linguistic Expert Assessment Results

Based on the results of the graphic image above, the media assessment from the language expert examiner has 3 aspects, namely, the first aspect is communicative. In this aspect, it obtained a percentage value of 90% with very feasible criteria. In the next aspect, namely language accuracy with feasible criteria, it obtained a percentage of 80%. The third aspect, namely suitability with student development, obtained a percentage value of 90% with very feasible criteria. The use of communicative language, language accuracy according to EYD, and suitability of student development must be considered in making media so that it is easy for students to understand. The results of the media assessment according to material experts are shown in the following figure 5.

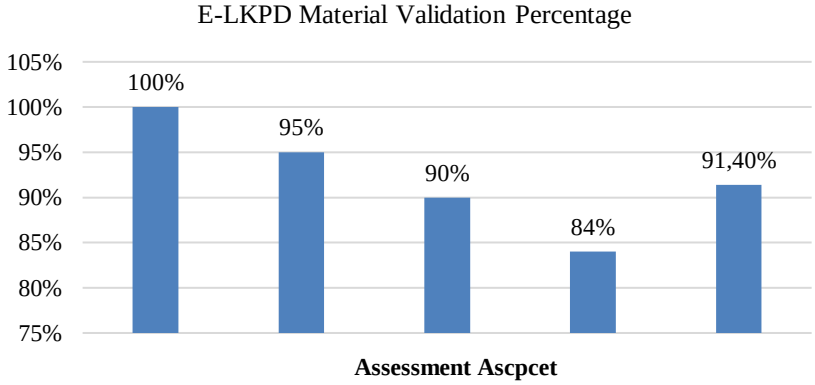

Figure 5. Results of Material Expert Assessment

Based on the graphic image above, it shows the results of the E-LKPD media assessment according to material experts. The aspects assessed include the breadth and completeness of the material with the criteria of very worthy of obtaining a percentage value of 100%, meaning that the content of the material in the E-LKPD is very worthy of use and contains enough sub-chapters in it. The second aspect, namely the truth of the content in terms of science, obtained a percentage value of 95% with the criteria of very worthy of use. The aspect of suitability with the Language curriculum obtained a percentage value of 90%. In this aspect, it is included in the criteria of media that is very worthy of use in terms of the suitability of the material with the applicable curriculum.

The aspect of conformity with the development of science and technology obtained a percentage value of 84% with a very feasible criterion. Next, the presentation aspect obtained a percentage value of 91.40% with a very feasible criterion. E-LKPD media, in terms of material, is very feasible to be used as a learning medium for students to train critical thinking skills. The latest research by Sari & Listiadi (2023) shows that validation by material, language, and media experts obtained an average of 88.25%, which is categorized as very feasible to be used in learning [25]. After the E-LKPD media is reviewed by the validator, it will be tested on students and science teachers with the following results. In the trial, the teacher showed a percentage of 91.4% with a very practical category, 95% of the average percentage value of student responses with very practical criteria. This shows that the E-LKPD media based on CTL containing local wisdom of Ngawi is very practical and provides a positive response to learning.

In the development stage, there is a test of question items before the questions are used as posttest questions for the experimental class and control class. The test of question items includes the validity of the question items presented in the following figure 6.

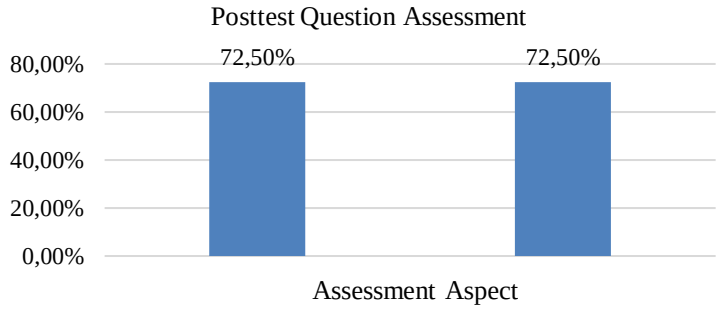

Figure 6. Question Assessment Results (Material Expert)

After the questions have been tested by the material expert lecturer, the next questions are given to the experimental class VII D, namely the class with learning using E-LKPD media based on CTL containing local wisdom and the control class VII E without using the media. The results of the normality test carried out are as table 3.

Table 3. Normality Test Results

Class		*Kolmogorov-Smirnova*			*Shapiro Wilk*		
		Statistics	*df*	*Sig.*	*Statistics*	*Df*	*Sig.*
Student learning outcomes	*Posttest* experimental class	0.199	18	0.057	0.918	18	0.119
	Posttest control class	0.204	18	0.047	0.952	18	0.456

The normality test was conducted using the Shapiro-Wilk test because the number of respondents was less than 30, namely only 18 students. Based on the table above, if the sig value> 0.05 then the posttest value is normal, if sig <0.05 then the data is not normal. The normality test on the experimental class posttest showed a sig value of 0.11> 0.05 and the control class posttest obtained a sig value of 0.45> 0.05, it can be said that the posttest values of the two classes are normal. The homogeneity test carried out showed the following results in table 4.

Table 4. Homogeneity Test Results

		Levene Statistics	df1	df2	Sig.
Student learning outcomes	Based on Mean	1.730	1	34	0.197
	Based on Median	1.477	1	34	0.233
	Based on Median and with adjusted df	1.477	1	32.414	0.233
	Based on trimmed mean	1.759	1	34	0.194

The level of significance used in this homogeneity test is α = 0.005. Based on the data table, if the significant value based on mean > 0.05, then the data is homogeneous. Meanwhile, if the significant value based on mean < 0.05, then it is not homogeneous. Based on the data table above, the significant value based on mean is 0.19 > 0.05, which can be concluded that the data value is homogeneous.

After conducting the normality test and homogeneity test, the next step is to conduct an independent sample t-test in table 5.

Table 5. Results of independent sample t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
						Significance		Mean Difference	Std. Error Difference
		F	Sig.	t	df	One-Sided p	Two-Sided p		
Learning Outcome	Equal variances assumed	1.730	0.197	16.335	34	0.000	0.000	50.222	3.075
	Equal variances not assumed			16.335	33.458	0.000	0.000	50.222	3.075

From the table above, the t-count result is 16.335 with a sig value of 0.197. The sigmoid value or p = 0.00 indicates that the p value of 0.00 <0.05, so it can be stated that the treatment in the two groups is different. In the experimental class with the treatment of using E-LKPD learning media based on CTL containing local wisdom, it has a positive impact. This is in line with the statement of Miliniawati & Isnaeni (2023) which states that the results of the independent sample t-test with a Sig value. (2-tailed) <0.05, which indicates that the use of PBL-based E-LKPD is effective in improving students' critical thinking [26]. The novelty in this study is a E-LKPD integrates Ngawi's local wisdom, namely Seloondo tourism as a learning resource, so that it not only improves students' critical thinking skills, but also instills ecological awareness and local culture. In addition, the use of the Liveworksheet website makes E-LKPD more interactive, flexible, and innovative than conventional LKPD.

4. CONCLUSION

This research successfully produced an Electronic Student Worksheet (E-LKPD) based on the Contextual Teaching and Learning (CTL) model that incorporates the local wisdom of Ngawi, specifically the Seloondo tourism area, to train students' critical thinking skills in ecosystem learning for Grade VII. The development of this E-LKPD is rooted in contextual learning principles that encourage students to connect scientific content with real-life local contexts, making science more meaningful and engaging. The E-LKPD is characterized by its integration of local cultural and environmental elements into learning content, combined with the interactivity of digital features provided through the Liveworksheet platform. This includes the use of videos, images, animations, and quizzes, which together enhance students' cognitive engagement and foster deeper understanding of ecological concepts. This format not only aligns with modern digital learning needs but also supports students' active participation and independent learning. In terms of feasibility, the product has been positively validated by experts. The material expert rated it as very feasible (91%), the language expert as feasible (76.3%), and the media expert as very feasible (91.7%). These results indicate that the E-LKPD meets quality standards in terms of content accuracy, linguistic clarity, and digital presentation. The high level of expert approval supports the use of this product as a complementary teaching resource in science education. The practicality of the E-LKPD was confirmed through user feedback, with students and teachers rating it as very practical, indicating that it is easy to use, accessible, and beneficial in classroom settings. This suggests that the product is not only theoretically sound but also adaptable to real-world teaching conditions. Furthermore, the effectiveness of the E-LKPD was empirically tested through a comparison between experimental and control groups. The results of the independent sample t-test showed a statistically significant difference (p = 0.000 <

0.05) in the improvement of students' critical thinking skills. This demonstrates that the use of CTL-based E-LKPD has a meaningful impact on students' higher-order thinking abilities, which are essential for mastering science content and developing problem-solving competencies. The implications of this research are significant for science educators and curriculum developers. The successful integration of local wisdom into science learning not only strengthens students' critical thinking skills but also fosters cultural appreciation and environmental awareness. This aligns with the goals of character education and the development of 21st-century skills. Schools can adopt similar approaches by designing learning materials that reflect students' local context while leveraging digital tools to enhance interactivity and engagement.

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