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DEVELOPMENT OF A JEMBER LOCAL WISDOM BASED E-LKPD USING ARTICULATE STORYLINE 3 TO IMPROVE ELEMENTARY STUDENTS' NUMERACY LITERACY SKILLS

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Abstract. This study aims to develop an Electronic Student Worksheet (E-LKPD) based on Jember local wisdom using Articulate Storyline 3 to improve elementary students' numeracy literacy skills. The development followed the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. The research subjects consisted of media experts, material experts, language experts, teachers, and fourth-grade students of SDN Mojosari 03, who were assigned to experimental and control classes. Data collection instruments included validation questionnaires, observations, interviews, as well as pretest and posttest numeracy literacy assessments. The results indicate that the developed E-LKPD meets the criteria of being highly valid, practical, and effective. Its effectiveness is demonstrated by the independent sample t-test, which shows a significant difference between the experimental and control classes (sig. 0.000 < 0.05), as well as the N-gain score of 81.75% in the experimental class, categorized as highly effective, compared to 28.33% in the control class, categorized as less effective. Thus, the Jember local wisdom–based E-LKPD is proven to enhance students' numeracy literacy skills.

Keywords: E-LKPD; Jember local wisdom; numeracy literacy; Articulate Storyline 3; ADDIE development; elementary school.

I. INTRODUCTION

Mathematics is a fundamental foundation for the development of science and technology. One of the essential skills students must master is numeracy literacy, as emphasized in the Merdeka Curriculum (Syamsudin et al., 2024; Adi, 2020). In the digital era, this skill needs to be strengthened through interactive learning media that are relevant to students' daily lives (Fadillah et al., 2023; Wijaya et al., 2016). Numeracy literacy involves the ability to use numbers and mathematical symbols to solve everyday problems (Salvia et al., 2022). At the elementary level, data presentation is one of the materials that supports numeracy literacy development because it trains students to collect, present, and analyze information (Purnomo, 2024). However, studies show that Indonesian students' numeracy literacy remains low at both national and international levels (Amaliya & Fathurohman, 2022; Matondang et al., 2023; OECD, 2023). Low conceptual understanding and the dominance of conventional teaching methods also affect students' learning motivation (Nurjanah et al., 2022; Widiastuti & Indriana, 2019).

One way to improve the quality of mathematics learning is by using digital, context-based teaching materials that relate to students' real-world experiences. Learning based on local wisdom has been shown to make content more meaningful and enhance motivation and understanding (Widiyasari et al., 2023; Ernawati et al., 2023). Observations at SDN Mojosari 03 revealed that fourth-grade students still struggle to analyze and communicate mathematical data. Of 20 students, 15 scored below 70. This issue is worsened by the use of general, non-contextual learning materials. In fact, engaging teaching materials significantly influence students' learning motivation (Ameriza & Jalinus, 2021). The Merdeka Curriculum also emphasizes the importance of connecting mathematical concepts to real-world phenomena (Warmansyah et al., 2023). One potential medium is the Electronic Student Worksheet (E-LKPD), which can present interactive, flexible content that is easily accessible to students (Apriliyani & Mulyatna, 2021; Haziatun Syakira et al., 2023).

In this study, the E-LKPD was developed using Articulate Storyline 3, which supports the integration of text, images, audio, video, and interactive quizzes, enabling students to experience more engaging learning and receive immediate feedback (Indasah et al., 2021). The local wisdom incorporated focuses on Jember cultural elements, including Tari Lahbako, Jember Fashion Carnival (JFC), the Puger Sea Ritual (Petik Laut), and Tanoker Egrang. These four cultural elements were selected because they remain active, are close to students' lives, and can provide authentic data for learning activities such as counting, comparing, and presenting information. Besides strengthening numeracy literacy, integrating local wisdom also fosters students' pride in their cultural heritage. Previous studies have shown that E-LKPD is effective in improving numeracy skills across various educational levels (Adrillian et al., 2024; Khadijah et al., 2022; Fikrina et al., 2023). However, research specifically developing an E-LKPD based on Jember

local wisdom for data presentation material in elementary schools is still limited. Based on the needs analysis and field findings, this study developed an E-LKPD based on Jember local wisdom as a solution to improve the numeracy literacy skills of fourth-grade elementary school students. Therefore, this research is titled: Development of a Jember Local Wisdom–Based E-LKPD to Improve Numeracy Literacy Skills of Elementary School Students."

II. RESEARCH METHODS

This study employed a Research and Development (R&D) method to produce a Jember local-wisdom–based E-LKPD and to test its effectiveness. The development model used was ADDIE (Analyze, Design, Develop, Implement, Evaluate), which is considered systematic, simple, and effective for developing instructional media (Branch, 2009; Siwardani et al., 2015).

Figure 1. ADDIE Development Model Stages

Development Procedures

The research procedure followed the five stages of the ADDIE model:

a. Analyze

The analysis stage was carried out to identify learning needs, curriculum requirements, and student characteristics.

1) The needs analysis indicated that the existing LKPD was still simple and had not optimally supported numeracy literacy. Therefore, an interactive and contextual Jember local-wisdom–based E-LKPD was required.
2) The curriculum analysis involved reviewing the Merdeka Curriculum for the Grade IV data presentation topic.
3) The analysis of student characteristics considered the developmental stage of 9–10-year-old learners, who prefer concrete, visual, and contextual learning experiences

b. Design

This stage resulted in the initial design of the product, including:

1) Developing a flowchart outlining the structure of the E-LKPD.
2) Creating a storyboard to map the layout, navigation, content, and learning activities.
3) Selecting images, audio, and interactive elements to be integrated using *Articulate Storyline 3*.

c. Development

The development stage included:

1) Creating the E-LKPD according to the storyboard design.
2) Conducting expert validation in the areas of content, media, and language using a Likert-scale instrument.
3) Revising the product based on expert feedback.
4) Conducting a small-group trial with six students to evaluate readability and initial practicality.

d. Implementation

The product was implemented in real classroom conditions through an experimental study using a Quasi-Experimental Design — Non-Equivalent Control Group Design.

1) The experimental class used the Jember local-wisdom–based E-LKPD.
2) The control class received conventional learning.
3) The following figure presents the research design

Rancangan Penelitaian Eksperimen pola *NonEquivalent Control Group Design*

Kelompok	*Pretest*	Perlakuan	*Postest*
Kls Eksperimen	O_1	X	O_2
Kls Kontrol	O_1	-	O_2

Sumber:(Sugiyono, 2019)

The learning activities were conducted in two classes (20 students each) using digital devices. Pretests and posttests were administered to measure the improvement in students' numeracy literacy skills.

e. Evaluation

Evaluation was carried out in two forms:

1) **Formative evaluation**, conducted at each stage of the ADDIE model through expert validation and user feedback.
2) **Summative evaluation**, conducted through students' posttest results to determine the effectiveness of the developed E-LKPD.

1. Trial Subjects

The trial subjects consisted of:

a. Expert validators (material, media, and language) from the Graduate Program of Universitas Negeri Malang.
b. Practitioners: a Grade IV teacher at SDN Mojosari 03.
c. Students: 6 students for the small-group trial, 20 students in Grade IV A as the experimental class, and 20 students in Grade IV B as the control class.

2. Types of Data

Qualitative data: validator comments, classroom observations, teacher interviews, and student responses, **Quantitative data:** expert validation scores, practicality scores, and pretest–posttest numeracy literacy results.

3. Data Collection Instruments

a. **Observation:** to examine classroom conditions, facilities, media, and student characteristics.
b. **Interviews:** conducted with the teacher to identify learning needs and conditions.
c. **Questionnaires:** expert validation questionnaires (material, language, media) and practicality questionnaires for teachers and students.
d. **Tests:** pretest and posttest to measure students' numeracy literacy skills.

4. Data Analysis

Qualitative data were analyzed descriptively based on comments from validators, teachers, and students.

Quantitative data were analyzed through: Percentage of product feasibility validation, Practicality assessment, Analysis of numeracy literacy improvement based on pretest and posttest results.

III. RESULT AND DISCUSSION

This study produced an interactive E-LKPD based on Jember Local Wisdom for Grade IV elementary students on the

Volume 10, Number 01, Page 136-140
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topic of Data Presentation, developed using Articulate Storyline 3. The product can be accessed through various digital devices and includes interactive features such as navigation menus, animations, audio, local cultural videos, practice activities, and numeracy literacy tests.

A. Development Stage Results

Based on expert validation, the following scores were obtained: the material expert provided a score of 80% (valid category) with suggestions for improvement related to adding enriched examples and deepening subtopics; the media expert provided a score of 79% (valid category) with recommendations to revise font consistency and strengthen visual design; and the language expert provided a score of 78% (valid category) focusing on simplifying sentences and ensuring consistency of terminology. Overall, the three validators stated that the product is feasible to use with revisions.

B. Implementation Stage Results

The trial was conducted with fourth-grade students at SDN Mojosari 03. Teacher responses toward the use of the E-LKPD reached 98.1%, categorized as highly practical, while student responses averaged 91%, also categorized as highly practical. These findings indicate that the E-LKPD is easy to use, engaging, and effective in helping students understand data presentation material in a contextual manner.

C. Data Analysis

The implementation of the Jember Local Wisdom–based E-LKPD developed using Articulate Storyline 3 was carried out in the experimental class, while the control class received conventional instruction. Students' numeracy literacy skills were measured through pretests and posttests using instruments developed based on numeracy literacy indicators. The pretest was administered offline to determine students' initial abilities. The distribution and frequency of pretest scores for the experimental and control classes are presented in Figure 2.

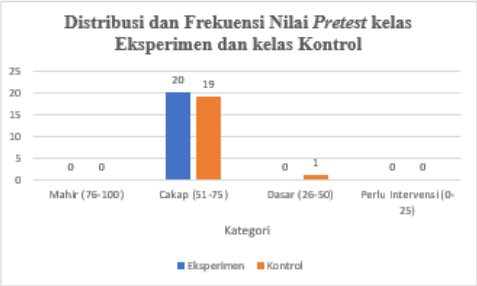

Figure 2. Bar Chart of the Distribution and Frequency of Pretest Scores in the Experimental and Control Classes

Based on the diagram above, it can be concluded that the students' initial numeracy literacy skills in both the experimental and control classes were relatively balanced prior to the implementation of the learning intervention. This is evidenced by the number of students categorized as *proficient*, which was 20 in the experimental class and 19 in the control class.

Meanwhile, the posttest was administered after the learning process in both classes had been completed. The experimental class used the E-LKPD based on Jember Local Wisdom, whereas the control class received conventional instruction. The numeracy literacy test was completed offline using test items integrated within the E-LKPD. The posttest results for both classes are presented in **Figure 3**.

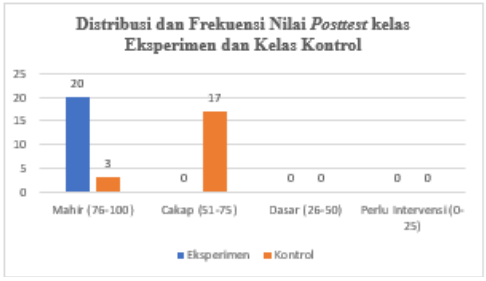

Figure 3. Bar Diagram of the Distribution and Frequency of Posttest Scores in the Experimental and Control Classes

Based on the diagram, it can be seen that all students in the experimental class achieved the *proficient* category, while most students in the control class were in the *competent* category. This indicates that the numeracy literacy skills of students in the experimental class after the learning intervention were higher than those in the control class.

D. Effectiveness Analysis of the E-LKPD

The effectiveness of the E-LKPD based on Jember Local Wisdom was analyzed through posttest results, statistical tests, and comparisons between the experimental and control classes. Prior to the hypothesis testing, the data met the requirements for normality and homogeneity.

1. Normality Test
   The Shapiro–Wilk test showed that both classes had significance values greater than 0.05 (experimental = 0.151; control = 0.328), indicating that the data were normally distributed.
2. Homogeneity Test
   Levene's Test produced a significance value of 0.224 (> 0.05), meaning that the two groups had homogeneous variances.
3. Hypothesis Testing
   The Paired Sample t-test for the experimental class showed Sig. 0.000 < 0.05, indicating a significant improvement between the pretest and posttest scores after using the E-LKPD.
   The Independent Sample t-test showed Sig. 0.000 < 0.05, indicating a significant difference between the experimental and control classes in the posttest results. This demonstrates that the E-LKPD is more effective than conventional learning.
4. N-Gain Test
   The average N-Gain of the experimental class was 81.75% (*highly effective*), while the control class had an N-Gain of 28.33% (*less effective*). This confirms that the use of the E-LKPD based on Jember Local Wisdom resulted in a substantially higher improvement in students' numeracy literacy skills.

Development of the Jember Local Wisdom–Based E-LKPD Using Articulate Storyline 3

The product developed in this study is an E-LKPD based on Jember Local Wisdom using Articulate Storyline 3 for

Volume 10, Number 01, Page 136-140
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Grade IV data presentation material. The E-LKPD was designed to improve numeracy literacy through interactive, engaging, and contextual learning. Local cultural elements such as *Tari Lahbako*, *Petik Laut*, *Egrang Tanoker*, and Jember Fashion Carnaval (JFC) were used as data contexts in tables, pictograms, and bar charts, making the material closer to students' experiences and easier to understand. The E-LKPD can be accessed online through various digital devices and is equipped with navigation features, user instructions, visual materials, cultural videos, interactive exercises, and evaluation questions. Drag-and-drop features and data visualization also make learning more active and increase students' cognitive engagement.

The implementation of the E-LKPD shows that its visual design and cultural context help students understand data presentation more meaningfully. Nevertheless, some students still experienced difficulties in reading and interpreting data, indicating the need for media that can facilitate step-by-step practice. This E-LKPD meets that need by providing engaging, interactive, and contextually relevant materials. Its content includes presenting, reading, and interpreting data using tally tables, pictograms, and bar charts directly linked to cultural phenomena in Jember. The use of illustrations, animations, and videos strengthens conceptual understanding and boosts students' learning motivation.

However, the E-LKPD also has limitations: access is only available online, requiring an internet connection, and the use of smartphones may potentially distract students. These challenges can be addressed through active teacher guidance during the learning process. Overall, the Jember Local Wisdom–based E-LKPD successfully increases students' motivation, engagement, and understanding of data presentation material, thereby contributing positively to the improvement of their numeracy literacy skills.

Effectiveness of the Jember Local Wisdom–Based E-LKPD on Students' Numeracy Literacy Skills

The implementation of the Jember Local Wisdom–based E-LKPD using Articulate Storyline 3 has been proven to enhance students' numeracy literacy skills. The results show a significant difference between the experimental class using the E-LKPD and the control class that received conventional instruction. The average numeracy literacy score of the experimental class was higher, supported by a greater N-gain score. This improvement occurred because the E-LKPD provides interactive and engaging learning experiences that align with the characteristics of students who are familiar with digital technology. Its appealing visuals and interactive features promote active participation, while the integration of local cultural contexts increases motivation and facilitates conceptual understanding.

The E-LKPD content incorporates cultural examples from Jember, such as traditional practices and local arts, making the data presentation material more relevant and meaningful. This contextual approach encourages students to think critically, solve problems, and better understand numeracy concepts. These findings align with the definition of numeracy literacy as the ability to understand and apply mathematical concepts across various contexts (Abidin, Yunus, et al., 2018).

IV. CONCLUSIONS

This study produced a Jember Local Wisdom–based E-LKPD developed using the ADDIE model, which was validated by material, media, and language experts and rated highly practical based on teacher and student responses. Furthermore, the implementation of the E-LKPD proved to be more effective than conventional learning in improving students' numeracy literacy skills, as indicated by the experimental class's effectiveness score of 81.75%, which was significantly higher than that of the control class at 28.33%.

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