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The Development of E-LKPD based on the Culturally Responsive Teaching Approach in IPAS Class IV Subjects of SDN Banyuajuh 3

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ABSTRACT

Technological developments create significant opportunities to improve the quality of the learning process, including the use of digital teaching materials. However, current learning practices still fail to integrate students' cultural values into learning activities. Based on these conditions, this study aims to develop an E-LKPD grounded in Culturally Responsive Teaching (CRT), designed as a teaching material that relates to students' cultures. This research employs a Research and Development (R&D) approach using a 4D development model comprising Define, Design, Develop, and Disseminate stages. Data for the study were collected through observation, the distribution of questionnaires to assess students' needs, interviews, and validation by material and teaching experts. The validation results showed validity rates of 88% for teaching material experts, 82% for material experts, and 86% for learning design experts, all of which were categorized as very valid. These findings demonstrate that the developed E-LKPD product is valid and learnable. Thus, it can be concluded that the development of E-LKPD based on Culturally Responsive Teaching, supported by the Liveworksheets platform, can serve as an innovative alternative for integrating cultural elements and students' backgrounds into the science learning process for grade IV SDN Banyuajuh 3.

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1. INTRODUCTION

The development of digital technology in the 21st century has had a significant impact on education. To remain superior and capable of facing challenges in the era of globalization, humans must adapt to rapid technological advancement (Akbar, 2019). The learning process, previously limited to conventional media, is now evolving with the advent of various digital innovations. One of these forms of innovation is the Electronic Student Worksheet (E-LKPD), which is designed to facilitate students' learning in an interactive, engaging, and time-relevant manner. In contrast to conventional LKPD, E-LKPD offers several advantages that are highly relevant to current technological developments (Nurajijah & Peniati, 2024). In addition, when students' enthusiasm for learning declines, E-LKPD can serve as an engaging teaching material. (Syafitri & Tressyalina, 2020).

The Independent Curriculum marks a step toward improving the education system and fostering more meaningful learning by emphasizing students' experiences to strengthen religious dimensions, skills, knowledge, and creativity, grounded in Pancasila values. Consistent with Swandari's (2023) view, the Independent Curriculum emphasizes flexibility, a focus on essential materials, and character development and student competencies. Learning is aligned with the educational unit's potential, enabling teachers and students to actively collaborate to create an interactive and meaningful learning process (Nahdiyah et al., 2022). The implementation of IPAS learning within the Independent Curriculum provides teachers with flexibility to design the learning process to meet students' needs. This subject is specifically designed to teach the complex relationships between humans, the environment, and natural and social phenomena in daily life (Ministry of Education and Culture, 2022). Teachers have the space to explore various learning tools, ranging from teaching materials, models, methods, and media to evaluation techniques, to create active, interactive, and engaging IPAS learning. Thus, social studies learning is expected to improve students' cognitive abilities, creativity, and social skills (Suhelayanti et al., 2023). In fact, IPAS is closely aligned with students' lived experiences because it addresses natural, social, and environmental phenomena.

However, in practice, social studies learning is often presented abstractly, regardless of the local cultural context, thereby reducing the meaning of learning and failing to deepen students' understanding. There are several problems in the implementation of the Independent Curriculum in science subjects, especially in social studies content. The main problem identified is the limited availability of teaching materials that fully meet students' needs and characteristics. The learning approach employed has not fully accounted for students' cultural diversity, and the available teaching materials are not aligned with the development and demands of modern learning. Without contextual approaches and teaching materials that encourage the exploration of ideas, students become less adept at generating and articulating ideas (Sumarni et al., 2023). Social studies learning plays an important role in shaping Pancasila students' profile as an ideal model of Indonesian education (Darniyanti et al., 2024). Unfortunately, social studies learning in elementary schools still tends to be conventional, teacher-centered, and emphasizes memorization. Therefore, learning innovation is essential, supported by models, approaches, and contextual and interactive media. Thus, the importance of mastery of knowledge and methodological diversity in learning that raises, discusses, and utilizes cultural diversity is the main requirement for the realization of inclusive and meaningful education (Gay, 2018).

Social studies learning requires an approach that connects the material to students' lived

experiences. Because students have diverse cultural backgrounds, instruction will be more effective when cultural perspectives are integrated. By incorporating students' values, experiences, and cultural perspectives, social studies learning becomes more meaningful and relevant, thereby encouraging active student engagement. According to Ladson-Billings (Gustiwi, 2017), Culturally Responsive Teaching is a learning approach that emphasizes the importance of students' cultural backgrounds in every aspect of the learning process. Rahmawati et al. (2017) explained that, through Culturally Responsive Teaching, teachers can bring the local cultural context, students' experiences, and the values they recognize into learning. In line with this, according to Ardi et al. (2024), teachers must adapt local cultural values to students' developmental stage and the learning strategies used when integrating them into elementary school learning. Culturally responsive teaching aims to train student engagement and performance through integrating cultural context into the learning process. Strong collaboration between educators, learners, curriculum, guidance techniques, and appropriate learning strategies and approaches is needed to achieve the four pillars of education in the 21st century (Sari, 2024). Thus, students feel valued and recognized, and they more easily understand the material because it is close to their daily lives.

This research is strengthened by prior findings that E-LKPD grounded in Culturally Responsive Teaching (CRT) has a positive impact on the learning process. Hermawan et al. (2025) found that the use of CRT-based E-LKPD increased students' motivation, engagement, and critical thinking skills, thereby improving learning outcomes. However, the research focuses solely on trigonometry, so further development is needed in other areas. Moreover, Efendi (2025) developed a Project-Based Learning-based E-LKPD that integrates local wisdom and obtains assessments that are very feasible to be used in learning. The product meets the validity standards for content, design, and presentation and aligns with the learning needs of the digital era. However, this study has not integrated the Culturally Responsive Teaching approach, which emphasizes recognizing and utilizing students' cultural diversity in the learning process.

Based on the background description, there appears to be an urgent need to develop teaching materials that optimize classroom learning by addressing students' needs and leveraging the potential of SDN Banyuajuh 3. Therefore, the researcher undertook a development study titled "Development of E-LKPD based on the Culturally Responsive Teaching approach in the science subject of grade IV SDN Banyuajuh 3". The development of teaching materials in the form of E-LKPD is expected not only to support learning in accordance with students' characteristics but also to provide a more interactive, contextual, and engaging learning experience.

2. METHODS

According to Sugiyono (2022), research and development (R&D) is a method researchers use to design, produce, or improve a product and then assess its effectiveness. In line with Slamet (2022), R&D primarily aims to assess the validity, effectiveness, and attractiveness of the products produced, thereby ensuring their quality and validity before wider use. R&D is carried out through several stages in succession, starting with needs analysis, product design, product manufacturing, and testing for validity and effectiveness, so that the resulting products provide real benefits to the wider community. This research was conducted on September 10, 2025, in Grade IV at SDN Banyuajuh 3, involving 26 students. The research on the development of E-LKPD based on the culturally responsive teaching approach in the science subject of grade IV SDN Banyuajuh 3 uses a research and development model (4D) proposed by Thiagarajan et al. (1976). The 4D model was chosen because it is considered

effective for guiding the development of various forms of teaching materials and learning tools (Arkadiantika et al., 2020). The following is a flowchart of the development model.

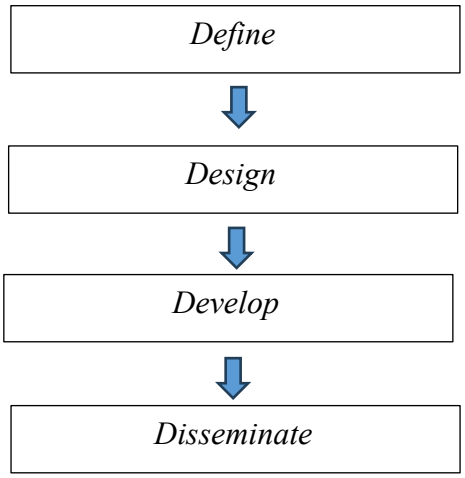

Figure 1. 4D Development Model Flowchart

The following are the stages carried out in the development of E-LKPD by applying the 4D model:

2.1 Define

At this stage, the curriculum, student characteristics, learning materials, and learning objectives are analyzed, and learning objectives are formulated. The goal is to identify the main problems and needs for developing relevant teaching materials. This analysis also includes mapping basic competencies, achievement indicators, and local cultural values that can be integrated into science learning.

Curriculum analysis: Through the curriculum analysis process, researchers can obtain information on the applicable curriculum, its implementation in the learning process, the learning approaches used, and the competencies expected of students when using the developed teaching materials. This analysis was conducted through an interview with the fourth-grade homeroom teacher at SDN Banyuajuh 3. The interview results indicated that the school had implemented the Independent Curriculum across all grade levels.

Analysis of student needs: The analysis focuses on students' interest in the learning process, the types of teaching materials commonly used as learning resources, students' understanding of material taught using government-issued materials, students' ability to operate mobile phones, students' preferences for the teaching materials used, their interest in learning materials, and the tendency of students' learning behavior during learning activities.

Material analysis: This process is conducted to ensure that the material presented aligns with the learning outcomes, students' characteristics, and the local cultural context relevant to students' lives. The analysis examines the structures of teachers' and students' books and compares them with the competencies expected in the Independent Curriculum.

Formulating goals: The results of this goal formulation serve as the basis for researchers to determine learning activities, prepare E-LKPD content, and design assessments for use at the product development stage. In addition, the abilities expected of students through the

application of E-LKPD teaching materials in social studies content IPAS learning activities in grade IV of SDN Banyuajuh 3 include the following aspects: (1) Students will learn the meaning of culture, its functions, and examples. (2) Students will learn about the local culture of Madura, especially Tanean Lanjhang, in depth. (3) Students will learn how to preserve culture and its benefits.

2.2. Design

Once needs are identified, the next stage is to design an initial E-LKPD form grounded in Culturally Responsive Teaching. At this stage, content design, layout, display design, and the selection of digital media to support student interactivity are finalized. The initial design also includes learning activities that integrate a cultural context close to students' lives.

All content in E-LKPD is designed to be relevant to students' socio-cultural context, namely the Madura community. Integrating this cultural context is an application of the Culturally Responsive Teaching (CRT) approach, which serves as the basis for developing teaching materials. The next stage is the visual design of the E-LKPD using the Canva platform, with attention to aesthetics and appeal to motivate students to learn. Students can access the E-LKPD interactively after downloading the prepared material as a PDF for further development on the Liveworksheets platform. To test and ensure the validity of the developed product, an assessment instrument and validation rubric were prepared and used by teaching material experts and material experts for the assessment process.

2.3 Development

This stage involves developing an E-LKPD grounded in Culturally Responsive Teaching (CRT) by converting the previous LKPD design into an interactive, adaptive digital format. The E-LKPD product includes various learning elements, such as reading texts, short fill exercises, and the integration of educational videos from YouTube to enrich students' learning experience. After development is complete, the teaching and learning materials are validated by 2 validators from PGSD lecturers at Jember State University, as follows: 1) The validation of teaching materials focuses on appearance, navigation, readability, interactivity, and suitability for grade IV elementary school students. 2) Material validation is carried out by reviewing the relevance of the content to the curriculum, the accuracy of the concepts, and the ability of E-LKPD to stimulate students' thinking skills.

Based on the validation results, product revisions and improvements are implemented across materials, instructions, and display design. This step aims to ensure that the E-LKPD produced has optimal quality, enabling it to function effectively in supporting the learning process.

2. 4 Dissemination

This stage involves disseminating the product, which researchers undertake after the development stage is complete. The dissemination activity was implemented using E-LKPD in social studies learning in grade IV at SDN Banyuajuh 3. The developed E-LKPD was integrated into the learning process, particularly on the topic of local culture and its preservation. During implementation, teachers served as learning facilitators by assisting students in accessing and using E-LKPD, guiding them through each stage of the activity, and managing discussions and reflections after the activity. Thus, students not only understood the material but also related it to the cultural context of their environment. In addition to classroom application, this stage includes disseminating research results through scientific publications. The article presents the development background, research methodology, product validity test results, and an analysis of the effectiveness of E-LKPD in learning.

Data analysis in this study employed both qualitative and quantitative methods. Qualitative data is non-numerical or not presented in the form of numbers. This analysis technique is used to process information in the form of input, criticism, and comments. In this study, qualitative data take the form of narrative descriptions obtained from various sources, such as expert assessments (material experts, teaching material experts, and learning design experts), teacher and student responses via questionnaires and observation sheets, and fully documented interviews with teachers. This qualitative analysis is used to assess the validity, effectiveness, and attractiveness of the developed product. Meanwhile, quantitative data are derived from the validation questionnaire completed by the two experts. In addition, the results of the student needs questionnaire analysis, using a Likert scale, were included as quantitative data. The Likert scale instrument used consists of five assessment categories, namely very lacking, lacking, adequate, good, and excellent, which function to measure the level of validity and effectiveness of E-LKPD more objectively. The data analysis process, based on input from teaching material experts and material experts, is carried out using a percentage calculation using the following formula:

$$Vah = \frac{Tse}{Tsh} \; x \; 100\%$$

Information:
Vah: Expert validation
Tse: Total score obtained (from validator)
Tsh: Maximum total score
Referring to the validity standards proposed by Akbar (2022), the level of validity is determined based on the validation results from media experts, material experts, and learning design.

Table 2. Product Validity Criteria (Akbar, 2022)

NO.	Score in percent (%)	Validity Categories
1.	81.25% ≤ *Vah* ≤ 100%	Very valid
2.	62.5% ≤ *Vah* < 81.25%	Valid
3.	43.75% ≤ *Vah* 62.5%	Invalid
4.	25.00% ≤ *Vah* 43.75%	Invalid

3. RESULTS AND DISCUSSION

3.1 Results

The result of this research is E-LKPD, a digital teaching material developed using the Liveworksheets platform as an interactive teaching tool. The E-LKPD product comprises learning materials and activities focused on local culture and its preservation. The development of this teaching material is grounded in the Culturally Responsive Teaching (CRT) approach, which aims to integrate students' cultures into the learning process. The structure of the E-LKPD is systematically organized, comprising a cover page, learning objectives, a learning objectives flowchart, instructions for use, materials, interactive learning activities, evaluation exercises, and joint reflection sheets. Each section is designed to be integrated, creating a contextual and meaningful learning experience for students.

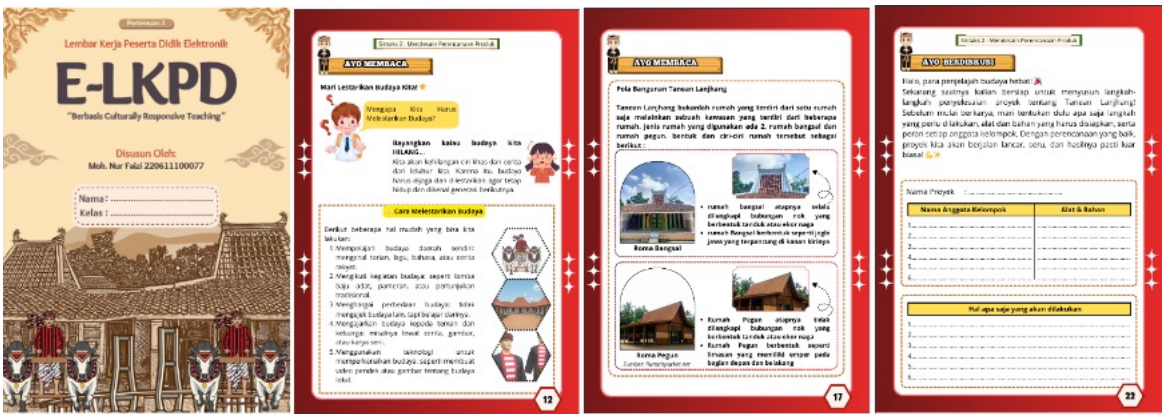

Figure 2. E-LKPD Display

The E-LKPD teaching materials were developed in Canva, a visual design tool, and subsequently converted to an interactive digital format using Liveworksheets. This E-LKPD product is provided as an active link for easy online access. In use, students only need to open the link shared by the teacher, then follow the prepared instruction flow to complete all learning activities. After development, the teaching materials are validated by teaching material and learning design experts to assess the content's validity and the quality of its presentation. The results of the data analysis were as follows:

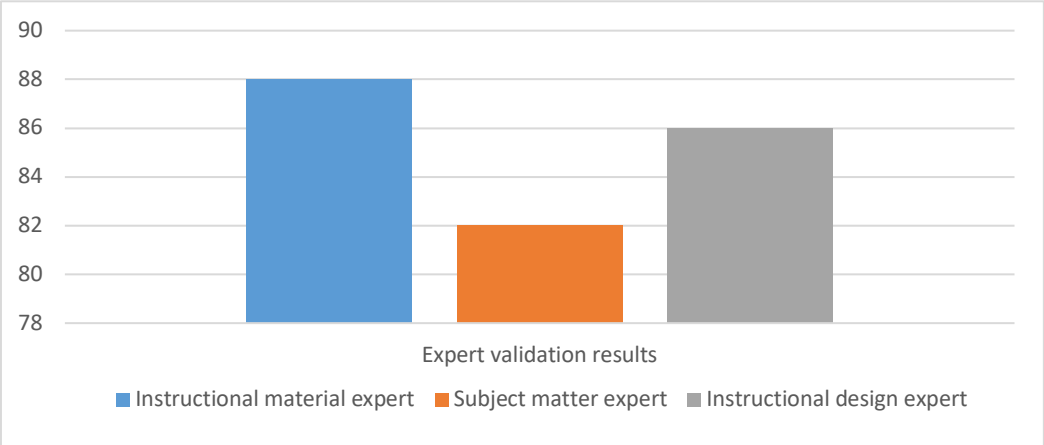

Figure 3. Expert Validation Results Diagram

Based on validation conducted by experts on E-LKPD using Culturally Responsive Teaching, the validity percentages were 88% among teaching material experts, 82% among material experts, and 86% among learning design experts. These results indicate that the developed E-LKPD is in the "very valid" category and has met the validity standards for developing digital teaching materials, with respect to content accuracy, clarity of presentation, and suitability of instructional design. With these achievements, E-LKPD is considered capable of becoming high-quality teaching material that supports the learning process and is relevant to students' cultural contexts.

3.2 Discussion

The development of E-LKPD based on Culturally Responsive Teaching (CRT) in the grade IV science subject at SDN Banyuajuh 3 is driven by the need to present learning that is more relevant, meaningful, and closer to students' lives. The CRT approach emphasizes the importance of incorporating learners' cultures, experiences, and values into the learning process to help them understand concepts more easily and feel valued. The development of E-LKPD-based teaching materials using Culturally Responsive Teaching and the Live worksheets platform began with researchers' observations in Grade IV at SDN Banyuajuh 3.

The observations show that the classroom learning process has not fully integrated the local cultural elements that students bring. The absence of such a cultural context makes learning less relevant and less contextual for students. Therefore, the application of Culturally Responsive Teaching is important, as it enables the tailoring of learning materials to students' experiences, values, and cultures (Alhamid et al., 2025). Thus, learning activities become more meaningful, increase learning motivation, and encourage students to complete learning tasks.

Based on validation conducted by teaching material experts and material experts, E-LKPD, which is based on Culturally Responsive Teaching, shows a very high level of validity. These findings indicate that the products developed have met all quality criteria, ranging from content to visual appearance and interactivity adjusted to students' characteristics. With these qualities, this E-LKPD is suitable for use as a teaching material that not only conveys content but also actively stimulates students' creativity through contextual, relevant activities. Examples of activities contained in E-LKPD include making a Tanean Lanjhang plan, creating miniature Tanean Lanjhang, and compiling Tanean Lanjhang mind maps. These activities are designed to encourage students to independently create projects, plan ideas, and connect their cultural experiences with learning concepts. The learning exercises compiled in the LKPD help students develop reasoning skills and solve problems that arise in daily life (Widiyanti, 2021). Thus, the implementation of E-LKPD is expected to facilitate active student participation, strengthen conceptual understanding, and improve student learning outcomes in Grade IV at SDN Banyuajuh 3.

The validation results showed that the developed teaching materials had a very high level of validity, with scores of 88% from teaching material experts, 82% from material experts, and 86% from learning design experts. Based on the validity criteria proposed by Arikunto (2010), these values fall into the Very Deserved category for use in learning activities. These findings indicate that E-LKPD, based on Live worksheets, has met the aspects of content validity and the design of teaching material development. These results align with research by Sarman et al. (2023), which reported a 90% validity rate in developing E-LKPD-based Live worksheets, and with research by Lestari (2021), which also shows that similar platform-based teaching materials are highly feasible. Based on the overall analysis, it can be concluded that the development of E-LKPD, based on Live worksheets, has the potential to be an effective innovation in supporting the implementation of interactive and contextual learning. E-LKPD is a digital learning tool that can be used to improve students' cognitive abilities through experiment-based learning activities (Rahayu & Budiyono, 2018).

The main purpose of developing E-LKPD teaching materials based on Culturally Responsive Teaching is to integrate students' existing cultural values and backgrounds into the learning process in grade IV at SDN Banyuajuh 3. The materials are designed in a structured format with components that support the achievement of learning objectives, including the cover, learning objectives, flow of learning objectives, instructions for use, materials, learning activities, evaluation questions, and collective reflection. Content in E-LKPD based on Culturally Responsive Teaching is prepared to take into account students' characteristics and needs, aiming to develop students' potential and competencies. The CRT approach is applied in this teaching material by aligning the local cultural context with students' learning environment, making learning more relevant, contextual, and meaningful (Khotimah et al., 2020).

3.3 Student Needs Analysis

The Need for Material Linkages to Local Culture: Students need IPAS materials that are directly linked to Madura culture so that learning feels closer to their lives. When the material includes examples, illustrations, and phenomena that are familiar to students, understanding becomes easier and more enjoyable. This interconnectedness also helps students understand that science is inseparable from their identity and sociocultural environment. In line with Nurpadela et al. (2024), learning will be more meaningful when the material is linked to a cultural context that is familiar to learners.

The Need for Digital and Interactive Teaching Materials: The current generation of students needs digital, interactive teaching materials because they are accustomed to using technology in their daily lives. Attractive digital media can increase learning motivation and reduce boredom that often arises when using conventional printed LKPD. In addition, interactive features in E-LKPD allow students to actively learn through animations, interactive buttons, or automatic exercises. In line with the opinion of Ivanka et al. (2025), implementing the CRT approach through digital media can create more contextual and inclusive learning, as local cultures can be visualized in a more engaging and accessible way.

The Need for a More Contextual Explanation of Material: Contextual explanations of IPAS material are urgently needed by students so that concepts are not only understood conceptually but also connected to their real lives. By including real examples from Madura's local culture—such as community activities, the surrounding environment, or regional traditions—students' understanding becomes stronger and deeper. This contextual approach also makes it easier for students to see the direct relevance of learning to everyday experience. Integrating local cultures can facilitate a more meaningful understanding of concepts (Anggraini et al., 2024).

Accessibility and Ease of Use Needs: Students also need an E-LKPD that is easily accessible anytime and anywhere, both at school and at home. User-friendly digital media will make it easier for students to learn independently without relying fully on the teacher's explanation. In addition, the simple yet attractive appearance makes students more comfortable using E-LKPD. This aligns with the opinion of Dwi et al. (2025), who argue that digital media based on local culture can create learning that is interesting, accessible, and in line with the character of the digital generation, thus supporting more flexible and relevant learning.

4. CONCLUSION

This study shows that the development of E-LKPD based on Culturally Responsive Teaching (CRT) in the grade IV science subject at SDN Banyuajuh 3 has succeeded in producing teaching materials that are decent, relevant, and in accordance with students' needs. The developed e-LKPD not only integrates local Madura culture into the learning process but also increases the meaning of the material through contextual, interactive, and student-centered approaches. The validation results showed that the quality of the teaching materials was very valid, with validation scores of 88% for teaching material experts, 82% for material expert validation, and 86% for learning design validation. These findings reinforce that CRT-based E-LKPD has met validity standards in terms of content, presentation, language, design, and the

suitability of the material to the cultural context. In addition, the analysis of student needs shows that social studies learning requires teaching materials that relate the material to local culture, are easily accessible, and are digital-based.

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