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Development of a Deep Learning-Based E-LKPD for Science and Social Studies (IPAS) on the Topic "My Region, My Pride" for Fifth-Grade Students

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Abstract: Deep Learning is an educational approach that focuses on improving the quality of learning and students' learning experiences. One of the learning strategies that integrates the Deep Learning approach is the use of technology, such as transforming printed student worksheets (LKPD) into electronic worksheets (E-LKPD). E-LKPDs not only contain direct-question tasks but can also be modified through gamification, which represents an integration of the Deep Learning approach. This study aimed to develop a feasible and effective Deep Learning-based E-LKPD to improve students' learning outcomes in Science and Social Studies (IPAS). The research employed the ADDIE development model consisting of Analysis, Design, Development, Implementation, and Evaluation stages. The results indicated that all three E-LKPDs were highly feasible. E-LKPD 1 achieved feasibility scores of 92.9% (didactic aspect), 85% (construction aspect), and 80% (technical aspect). E-LKPD 2 obtained 91.4%, 85%, and 80%, respectively, while E-LKPD 3 achieved 90%, 84%, and 81.25%, respectively. The N-Gain test showed that all three E-LKPDs were moderately effective in improving students' IPAS learning outcomes on the topic *My Region, My Pride* in Grade V of SDN 36 South Pontianak, with N-Gain scores of 62.8%, 62.3%, and 62.1%, respectively. Student responses were highly positive overall. The three E-LKPDs received very positive ratings in terms of appearance (84.5%–85.3%) and usefulness (85.8%–86.4%), while presentation aspects were rated positively (82.6%–83.8%). These findings suggest that Deep Learning-based E-LKPDs are feasible, effective, and well-received as learning media.

Keywords: Deep Learning; Electronic Student Worksheets (E-LKPD); Learning Outcomes; Science and Social Studies (IPAS)

Introduction

Framework of the Merdeka Curriculum, the disciplines of Natural Sciences (IPA) and Social Sciences (IPS) have been integrated into a single subject known as Science and Social Studies (IPAS). The primary focus of IPAS learning is not the quantity of content delivered but rather the extent to which students develop competencies and construct meaningful learning experiences by utilizing the knowledge they already possess (Kemendikbud, 2022). IPAS learning emphasizes enhancing the knowledge and experiences of elementary school students in relation to their local environment, including the integration of local wisdom into the learning process.

Recently, the concept of Deep Learning has been continuously promoted to enhance students' analytical and innovative abilities, which are considered essential for future life and are aligned with the principles of the Merdeka Belajar Curriculum (Natsir, 2025).Meaningful, mindful, and enjoyable learning have been identified as fundamental elements supporting the implementation

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of Deep Learning in education (Feriyanto & Anjariyah, 2024). From the perspective of Bloom's Taxonomy, Deep Learning encompasses the domains of applying, analyzing, evaluating, and creating (Natsir, 2025), indicating that it emphasizes the development of higher-order analytical thinking skills (Sulistyanto et al., 2024).

The implementation of Deep Learning can be observed through efforts to update instructional content and reform conventional teaching methods to foster independent practice, stimulate learning interest and awareness, and guide students in constructing more comprehensive knowledge (Kong & Hao, 2022). Deep Learning is closely associated with the intensive use of technology (Natsir, 2025). Technology is not merely utilized as a learning medium but becomes an integral component of the learning process. Its implementation can take various forms, such as developing electronic teaching materials including e-books, electronic worksheets (E-LKPDs), e-modules, and others (Bina et al., 2022), as well as utilizing digital platforms as learning tools, as widely practiced during the COVID-19 pandemic (Gumelar & Dinnur, 2020).

Electronic Student Worksheets (E-LKPDs) represent one form of such instructional material development. Traditionally, LKPDs were printed worksheets containing identity information, assignments, and supporting illustrations. With technological advancement, printed LKPDs can now be transformed into electronic formats. The components commonly included in E-LKPDs are: cover page; learning outcomes; learning objectives; instructional materials; activity guidelines or work procedures; assignments; conclusions; and assessments (Baihaki et al., 2021; Prastowo, 2015; Saraswati et al., 2021). One advantage of E-LKPDs is their ability to serve as both instructional media and assignment tools in a more engaging manner, thereby fostering multidirectional interaction and increasing students' learning motivation (Apriliyani & Mulyatna, 2021).

LKPDs constitute an essential component of classroom instructional planning (Herdiansyah, 2018) due to their significant role in achieving learning objectives (Hamidah dkk., 2018). During the learning process, teachers provide guidance through verbal explanations and written instructions, which can be incorporated into LKPDs (Revita, 2017). Students' mastery of learning materials can also be assessed through LKPDs, making them an indispensable element of the teaching process (Nurafriani & Mulyawati, 2023). Therefore, their development requires careful preparation and systematic planning to maximize learning outcomes (Hamidah dkk., 2018).

The development of E-LKPDs can provide a solution for creating effective and engaging instructional materials that improve students' learning outcomes (Puspita et al., 2023). In addition, E-LKPDs assist teachers in designing learning activities that emphasize discovery learning and process skill development (Ariadi, 2017). The development process must fulfill three major requirements: didactic, constructional, and technical requirements (Prastowo, 2015; Revita, 2017). Meanwhile, the effectiveness of E-LKPDs in improving learning outcomes can be evaluated by analyzing the mean scores of pretests and posttests (Raras et al., 2024).

Numerous previous studies have investigated the development of digital worksheets. For example, Puspita (2023) developed a digital LKPD assisted by the FastStone application. The final product was a PDF-based digital worksheet stored in Google Drive and distributed through a shareable link. Although the study successfully transformed printed worksheets into digital formats, the resulting product lacked interactive features. This finding inspired the present researcher to develop an electronic worksheet that incorporates interactive elements and can be operated through mobile devices.

Based on information obtained from an interview with the Grade VB teacher at SDN 36 South Pontianak, efforts have been made to implement learning activities that emphasize student participation and the utilization of digital devices. The school possesses adequate facilities and infrastructure, including Chromebooks, speakers, and LCD projectors. Internet access is available and stable, supported by routers installed in several classrooms. These technologies are used to display images, PowerPoint presentations, and educational videos from YouTube. Despite the availability of sufficient technological resources, information technology integration has not yet been fully implemented across all grade levels. Nevertheless, teachers continue to strive for greater technology integration in classroom instruction.

An examination of the teacher's lesson plans revealed that they already include learning objectives, learning sequences, and assessment procedures. Commonly applied instructional methods include discussions, lectures, and question-and-answer sessions, while Cooperative Learning and Problem-Based Learning are the most frequently selected learning models. However, the lesson plans have not yet integrated learning concepts that explicitly reflect Deep Learning principles. Meaningful learning and joyful learning, which are fundamental elements of Deep Learning, can be facilitated through the implementation of Project-Based Learning and gamification strategies (Feriyanto & Anjariyah, 2024).

The primary learning resources currently used are textbooks obtained from the school library. These

textbooks generally present examples of local wisdom from various regions across Indonesia rather than prioritizing the local wisdom of the students' immediate environment. Ideally, learning should begin by helping students understand their closest surroundings before expanding their understanding to broader regional and national contexts. Such an approach enables students to build knowledge from familiar environments before exploring broader contexts comprehensively (Duratun et al., 2024).

To support learning activities, teachers prepare student worksheets (LKPDs) to facilitate inquiry and provide meaningful learning experiences. In principle, LKPDs are not merely collections of student assignments but also include learning materials and instructional guidance, making them an important form of teaching material (Prastowo, 2015). However, the classroom teacher perceived LKPDs only as worksheets containing tasks or questions to be completed by students. This misconception is reflected in the LKPDs currently used, which consist only of student identity information, images, and questions assessing conceptual understanding without incorporating learning materials or clearly stated learning objectives. Moreover, these worksheets are still printed materials adapted from internet sources or textbooks. As a result, the transformation from conventional printed LKPDs to a Deep Learning-oriented electronic LKPD (E-LKPD) has not yet been implemented.

Interviews with Grade VB students at SDN 36 South Pontianak revealed that IPAS is not particularly favored because the material is difficult to visualize, contains unfamiliar vocabulary, requires extensive memorization, and is perceived as somewhat boring. Based on students' semester achievement in the topic "My Region, My Pride," fewer than 50% of the 25 students achieved the Minimum Learning Competency Criteria (KKTP) score of 70. Therefore, students' IPAS learning outcomes can be categorized as relatively low.

To identify the need for instructional materials, a needs-analysis questionnaire was distributed to elementary school teachers in Pontianak City through Google Forms. Among the 25 respondents, 20 teachers reported difficulties in teaching specific IPAS topics. These challenges affect students' conceptual understanding, as indicated by 22 teachers who stated that students often struggle to understand abstract IPAS concepts. Such difficulties ultimately contribute to low learning outcomes. Furthermore, 19 teachers agreed that existing IPAS teaching materials tend to emphasize examples of local wisdom from various regions of Indonesia without prioritizing local wisdom from the students' surrounding environment. Learning materials based on local wisdom and contextual examples have the potential to enhance students' understanding of IPAS concepts (Duratun et al., 2024).

The needs analysis further revealed that 21 teachers strongly agreed (60%) or agreed (24%) that the availability of digital IPAS teaching materials remains limited. Similarly, 21 teachers strongly agreed (20%) or agreed (64%) that local wisdom-based IPAS instructional materials are still scarce in schools. In addition, 22 teachers strongly agreed (64%) or agreed (28%) that Deep Learning-based IPAS teaching materials are not widely available.

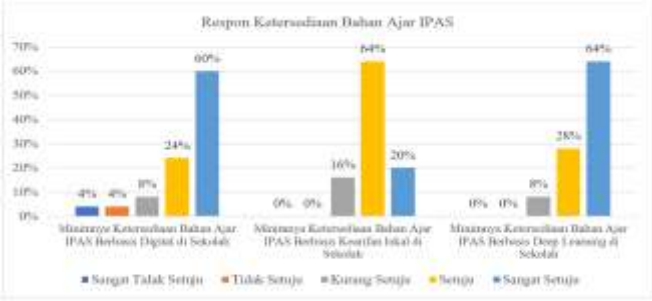

Figure 1. Teachers' Responses Regarding the Availability of IPAS Teaching Materials in Schools

Based on teachers' responses, it can be concluded that there is a strong need for interactive, innovative, and local wisdom-based instructional materials grounded in Deep Learning principles. Consequently, the development of a Deep Learning-based IPAS E-LKPD using the Liveworksheet platform was considered necessary.

Figure 2. Perceptions of the Need for IPAS Teaching Materials

Considering the learning problems identified and the results of the needs analysis, this study seeks to develop a Deep Learning-based E-LKPD for the IPAS topic "My Region, My Pride." The primary objectives are to describe the development procedures and to determine the feasibility and effectiveness of the Deep Learning-based E-LKPD in improving the IPAS learning outcomes of fifth-grade elementary school students.

Method

This development research was conducted to design, develop, and evaluate the feasibility and effectiveness of a product aimed at improving students' learning outcomes. The entire research process was guided by Branch's ADDIE model, which consists of the following five stages.

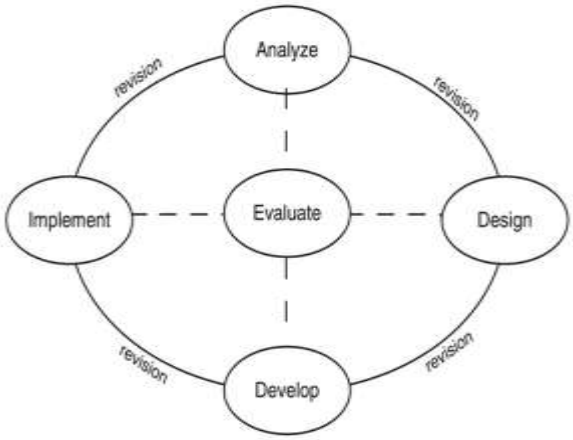

Figure 3. Steps of the ADDIE Development Model

A total of 25 fifth-grade students were involved in this study. Data collection techniques included questionnaires and tests, while the instruments used for data collection consisted of feasibility questionnaires, response questionnaires, as well as pretest and posttest questions. The questions were developed based on the formulated instructional objectives.

Gregory Test

Before the instruments were used for data collection, a content validity test was conducted using the Gregory model. The Gregory test aims to ensure the validity of an instrument. This test was administered to two raters. Meanwhile, to present the data, a result tabulation matrix and cross-tabulation were utilized. To calculate the content validity, the following formula was used:

$$CV = \frac{D}{A+B+C+D} \quad (1)$$

CV is an acronym for Content Validity. A represents the total number of items rated as less relevant by both raters. B represents the total number of items considered relevant by rater I and less relevant by rater II. Meanwhile, the total number of items rated as less relevant by rater I and relevant by rater II is denoted by the letter C. Lastly, D represents the total number of items considered relevant by both raters.

The calculation results are then categorized based on the instrument validity coefficient criteria by Meivinia et al. (2023). An instrument is classified as having very high validity if the coefficient is > 0.79; high validity if the coefficient falls within the range of $0.6 - 0.79$; moderate validity if the coefficient value is in the range of $0.4 - 0.59$; low validity if it is within the range of $0.2 - 0.39$; and very low validity if the coefficient is less than 0.2. The success criterion for this Gregory test is achieved if the evaluated instrument falls into at least the "high" category or has a value > 0.59

Feasibility Test of Deep Learning-Based E-LKPD

Meanwhile, the feasibility questionnaire was developed based on the theory of Student Worksheet (LKPD) preparation requirements, which consist of didactic, constructive, and technical aspects. The response options use a Likert scale with a weight score ranging from 1 to 5. From the assigned scores, the percentage is then calculated using the following formula:

$$\rho = \frac{\sum x \text{ x } 100\%}{\sum xi} \quad (2)$$

The feasibility percentage is expressed as ρ, where$\sum x$ represents the total score of all validators' responses, and the maximum possible response score is symbolized by $\sum xi$. To determine the feasibility level of the E-LKPD, the learning material feasibility criteria by Duratun et al., (2024) are used as a reference. If the percentage score is > 80%, it is declared very feasible. If the percentage score falls within the range 61% - 80%,, it is declared feasible. Meanwhile, if it is within the range of 41% - 60%, it is declared moderately feasible. If it is within the range of 21%-40%, it is declared unfeasible. Otherwise, if the score is < 21%, it is declared highly unfeasible. The desired feasibility standard in this study is achieved if the E-LKPD meets a minimum criteria of "feasible" or attains a percentage score of at least 61%.

Effectiveness Testing of Deep Learning-Based E-LKPD

The effectiveness of the E-LKPD was evaluated based on two aspects, namely learning outcomes and students' responses. To determine improvements in learning outcomes, the mean pretest and mean posttest scores were calculated (Raras et al., 2024). The mean score was obtained by dividing the total score achieved by all students by the number of students.

In addition to comparing the mean scores, an analysis was conducted to determine the effectiveness of the treatment provided using the normalized gain test. The normalized gain analysis is an evaluation tool that not only measures individual progress but also reflects overall learning success in a holistic manner (Sukarelawan et al., 2024). The formula used in this study refers to Raras et al. (2024), as follows:

$$N\ Gain = \frac{Spost - Spre}{Smaks - Spre} \quad (3)$$

Where *Spost* represents the posttest score, *Spre* represents the pretest score, and *Smax* represents the maximum possible score of the test. After obtaining the calculation results, an interpretation was conducted to determine the effectiveness level of the treatment provided. The effectiveness criteria used in this study refer to Sukarelawan et al., (2024) with the following classifications. The E-LKPD is considered effective in improving learning outcomes if the normalized gain test results fall within the high or moderate categories.

Table 1. Classification of Normalized Gain Scores

Criteria	Score
High	$0.70 \leq n \leq 1.00$
Moderate	$0.30 \leq n < 0.70$
Low	$0.00 < n < 0.30$
No Improvement	$n = 0.000$
Decrease	$-1.00 \leq n < 0.00$

Table 2. Criteria for Determining Effectiveness Level

Percentage (%)	Interpretation
< 40	Ineffective
40–55	Less Effective
56–75	Moderately Effective
> 76	Effective

Meanwhile, students' responses were used to obtain feedback regarding the readability level, attractiveness, and overall perceptions of the E-LKPD implemented in the learning process. The assessment employed a five-point Likert scale ranging from 1 to 5. After administering the questionnaire, the percentage of students' responses was calculated based on the procedure proposed by Duratun et al. (2024), as follows:

$$\rho = \frac{\sum x\ x\ 100\%}{\sum xi} \quad (4)$$

The feasibility percentage is expressed by "ρ", while ∑x represents the total score of the validators' responses (actual score). The calculated results are then classified to determine students' responses toward the developed E-LKPD using Arikunto's (2017) criteria, namely: very positive if the score is ≥85%, positive if the score ranges from 70%–84%, less positive if the score ranges from 50%–69%, and not positive if the score is <50%.

Result and Discussion

The development of the Deep Learning-based E-LKPD referred to all stages of the ADDIE model. The analysis stage was conducted to obtain actual information related to problems encountered in the field. In addition, curriculum analysis and needs analysis were also carried out. The results showed that the school had fully implemented the Merdeka Curriculum as stated in the Regulation of the Indonesian Ministry of Primary and Secondary Education (Permendikdasmen RI) Number 13 of 2025. The IPAS content included in intracurricular learning had referred to the Learning Outcomes in accordance with the Regulation of the Ministry of Education, Culture, Research, and Technology (Permendikbudristek) Number 46 of 2025. Therefore, the Deep Learning-based E-LKPD was adjusted to the implemented curriculum during the development process.

Meanwhile, the needs analysis aimed to identify students' needs and the need for E-LKPD in the IPAS learning process. The interview results revealed that the school already had adequate technological facilities, especially with the addition of smartboard assistance this year that could be utilized for learning activities. Based on the teacher response questionnaire, information was obtained that the availability of Deep Learning-based digital IPAS teaching materials containing local wisdom content in elementary schools in Pontianak City was still limited. The analysis results showed that all 25 teachers involved as respondents stated that Deep Learning-based digital IPAS teaching materials containing local wisdom content were needed for learning activities.

After analyzing the problems in the field, the next stage was designing the Deep Learning-based E-LKPD. The stages included developing the material/content by reading and analyzing teaching materials from various learning resources. Subsequently, a storyboard was developed as a visual representation of the E-LKPD design to be created in Canva. At this stage, the local wisdom elements to be included on each page of the E-LKPD were determined. Since the developed E-LKPD covered materials for one chapter, this research produced three E-LKPD products with different subtopics/material contents.

The three E-LKPDs had different designs and were created based on the prepared storyboard. Each page contained the chapter title and subtopic, developer identity, class identity, and phase identity. The cover page of E-LKPD 1 featured an image of a map showing the West Kalimantan region, an image of the Bamboo Spear Monument, an image of the Equator Monument, images of Dayak traditional dances complete with traditional clothing, and images of fern plants commonly found in West Kalimantan. The cover page of E-LKPD 2 contained images of a longhouse and the Ruai Dance of West Kalimantan. Meanwhile, the cover page of E-LKPD 3 featured images of a longhouse, Dayak

traditional dances complete with traditional clothing, and fern plants commonly found in West Kalimantan. Each E-LKPD design also differed in terms of color, ornaments, layout, content, and gamification.

In addition to the cover page, each E-LKPD also contains several other pages, namely: (1) learning outcomes and learning objectives, (2) learning materials or content, (3) instructions or work procedures, (4) tasks to be completed, and (5) conclusions. The learning outcomes and objectives page contains complete E-LKPD identity information. On this page, students can also write their respective group identities. Meanwhile, the material or learning content page contains brief explanations of a learning topic. The materials presented in each E-LKPD differ because one E-LKPD is designed for only one subtopic. Likewise, the contents of the instruction and task pages in each E-LKPD are not the same. The tasks included in each E-LKPD are packaged in the form of gamification consisting of several stages with different mission according to the topic of the E-LKPD. On the conclusion page, students can write conclusions related to the learning activities that have been carried out.

(a) (b) (c)

(d) (e) (f)

(g) (h) (i)

Figure 4. E-LKPD development: (a, b, c) Cover Page Display of the E-LKPD; (d, e, f) Instruction or Work Procedure Page in the E-LKPD; and (g, h, i) Initial Display of the Task Page in the E-LKPD

After the entire E-LKPD design was completed, the E-LKPD was uploaded to the Liveworksheet website to add multimedia functions. The completed E-LKPD could then be shared through a copied link. The developed E-LKPD product was subsequently tested for feasibility by content experts and media specialists until it achieved at least a feasible category. During the implementation process, the E-LKPD was tested on students. At the end of the implementation process, students provided responses through a response questionnaire sheet. Finally, an analysis of learning outcomes and student responses was conducted to evaluate the effectiveness of the product in improving IPAS learning outcomes.

Results of the Gregory Test

The Gregory test was conducted by two raters with minimum qualifications of having completed a master's degree and possessing expertise in objectively assessing instruments. Based on the assessments of both raters, the content validity was found to be 1.00, indicating that the feasibility of the questionnaire was categorized as very high. Although it was declared feasible, there were several revision notes, including simplifying sentences to make them easier to understand and improving inappropriate phrases that obscured the meaning of questionnaire items. The questionnaire was then revised according to the notes provided by the two raters.

Meanwhile, the validity test results for the pretest questions showed that the content validity of pretest 1 was 0.90, pretest 2 was 0.90, and pretest 3 was 1.00. Therefore, all three pretest questions were declared to have very high feasibility criteria. However, there were several revision notes, including improvements and adjustments to images and descriptions in the questions, as well as inconsistencies between operational verbs and the cognitive level of the questions. Consequently, the test blueprint and question items that received notes were revised to make them more appropriate for use.

The validity test results for the posttest questions showed that the content validity values for posttest 1, 2, and 3 were coincidentally the same, namely 1.00. Thus, all three posttest questions were declared to have very high feasibility. Nevertheless, there were still several revision notes, including the addition of question stimuli, emphasis on question keywords, correction of spelling errors, improvement of question instructions, revision of unsuitable image choices, and adjustment of the cognitive level of the questions. Therefore, the test blueprint and question items that received notes were revised to make them more suitable for use.

Meanwhile, the student response questionnaire obtained a content validity score of 1.00. This means that the student response questionnaire was feasible for use. However, there were still revision notes, particularly regarding the selection of phrases and words. Therefore, the student response questionnaire was revised again according to the provided notes.

Results of the Feasibility Test of Deep Learning-Based E-LKPD

The three E-LKPDs were then validated by two content experts and two media specialists with the following results.

Table 3. Feasibility Results of the Deep Learning-Based E-LKPD

E-LKPD	Assessment Aspect	Maximum Score	Obtained Score	Percentage (%)	Category
1	Didactic	70	65	92.9	Very Feasible
	Construction	100	85	85	Very Feasible
	Technical	80	80	80	Feasible
2	Didactic	70	64	91.4	Very Feasible
	Construction	100	85	85	Very Feasible
	Technical	80	80	80	Feasible
3	Didactic	70	63	90	Very Feasible
	Construction	100	84	84	Very Feasible
	Technical	80	65	81.25	Very Feasible

It is known that the three E-LKPDs obtained an average assessment in the "very feasible" category. Based on the validation results of the didactic aspect, E-LKPD 1 was classified as "very feasible" with a score of 92.9%, E-LKPD 2 was classified as "very feasible" with a score of 91.4%, and E-LKPD 3 was classified as "very feasible" with a score of 90%. These results indicate that the three E-LKPDs had an average percentage above 90%. This means that there is an indication that the three E-LKPDs are aligned with the formulated learning outcomes and objectives, contain a logical sequence of material presentation, provide diverse stimuli, and can facilitate individual differences so that all students can learn optimally regardless of variations in learning speed. The developed E-LKPD design was considered strong and suitable for use as an effective independent learning medium.

Meanwhile, the validation results of the construction aspect showed that E-LKPD 1 and E-LKPD 2 were categorized as "very feasible" with a percentage of 85%, while E-LKPD 3 was categorized as "very feasible" with a percentage of 84%. Based on these results, the feasibility percentages ranged from 84%–85% and were consistently categorized as very feasible. These findings prove that, from the construction aspect, the three E-LKPDs use language appropriate to children's age levels, employ vocabulary in accordance with the Indonesian Dictionary (KBBI), use clear and understandable sentences, contain more illustrations/images than text, and provide varied learning resources. In addition, this aspect also indicates that the E-LKPD meets standard specifications as a digital-based product because its capability is not merely transforming physical forms into digital PDF formats. Instead, it also enables students to fill in and/or write directly on the E-LKPD sheets with the assistance of technological devices.

From the validation results of the technical aspect, E-LKPD 1 and E-LKPD 2 both obtained a percentage score of 80% and were declared "feasible." Meanwhile, E-LKPD 3 obtained a percentage score of 81.25% and was declared "very feasible." The assessments of the three E-LKPDs were within a high range, namely 80%–81.25%. Technically, the presentation of text, images, and display met the required standards. The E-LKPDs were designed using readable fonts, consistent writing styles, emphasized sentence structures through bold formatting, appropriate image/illustration selection, and proper image placement so as not to cover the text. Overall, the E-LKPD displays were considered attractive and capable of focusing students' attention during learning activities.

Results of the N-Gain Test

After implementing the E-LKPD with fifth-grade students, the following pretest and posttest scores were obtained.

Table 4. Recapitulation of Students' Learning Outcomes

Learning Outcomes	Pretest 1	Posttest 1	Pretest 2	Posttest 2	Pretest 3	Posttest 3
Average	52.8	79.2	53.2	78.8	51.6	79.2
Highest Score	80	100	90	100	80	100
Lowest Score	20	50	20	50	20	40

It is known that the average pretest 1 score was 52.8, while the average posttest 1 score was 79.2. These results indicate an increase of 26.4 points. This increase proves that the intervention of E-LKPD 1 in learning activities was able to stimulate students' conceptual understanding more effectively, resulting in improved learning outcomes after using E-LKPD 1.

The average pretest 2 score obtained was 53.2, while the average posttest 2 score was 78.8. These results indicate an increase of 25.6 points after using E-LKPD 2 in learning activities. This means that the intervention of E-LKPD 2 was able to facilitate students in reconstructing their conceptual understanding more effectively.

The average pretest 3 and posttest 3 scores were 51.6 and 79.2, respectively. Based on these results, there is a strong indication that the implementation of E-LKPD 3 had a positive impact on improving learning outcomes. The increase of 27.6 points proves that the intervention of E-LKPD 3 significantly enhanced students' cognitive understanding. Explicitly, there was evidence of improved learning outcomes by comparing the averages before and after learning. However, further N-Gain calculations were conducted to ensure the effectiveness of the product, as follows.

Table 5. Results of the N-Gain Normality Test

E-LKPD	Spost	Spre	Spost-Spre	Smaks-Spre	N-Gain Score	N-Gain Criteria	N-Gain (%)	Effectiveness Criteria
1	79.2	52.8	26.4	47.2	0.628	Moderate	62.8%	Quite Effective
2	78.8	53.2	25.6	46.8	0.623	Moderate	62.3%	Quite Effective
3	79.2	51.6	27.6	48.4	0.621	Moderate	62.1%	Quite Effective

The average N-Gain score obtained for E-LKPD 1 was 0.628, which falls into the moderate category. Meanwhile, the average percentage of the N-Gain score for E-LKPD 1 was 62.8%, or rounded to 63%. This means that the effectiveness level of E-LKPD 1 was considered quite effective. Based on the data distribution of 25 students, no student (0%) was categorized as "low," 17 students (68%) were categorized as "moderate," and 8 others (32%) were categorized as "high." These findings indicate that E-LKPD 1 was evenly internalized by students with various initial ability levels.

Meanwhile, the average N-Gain score for E-LKPD 2 was 0.623, which also falls into the moderate category. The average percentage was 62.3%, or rounded to 62%.

This means that the effectiveness level of E-LKPD 2 was also considered quite effective. Based on the data distribution of 25 students, no student (0%) was categorized as "low," 16 students (64%) were categorized as "moderate," and 9 others (36%) were categorized as "high." These results indicate that the implementation of E-LKPD 2 provided excellent opportunities for all students with varying initial ability levels.

The table also shows that the average N-Gain score for E-LKPD 3 was 0.621, which falls into the moderate category. The average percentage was 62.1%, or rounded to 62%. This means that the effectiveness level of E-LKPD 3 was also considered quite effective. Based on the data distribution of 25 students, 1 student (4%) was categorized as "low," 17 students (68%) were categorized as "moderate," and 7 others (28%) were categorized as "high." The existence of students in the low category serves as an evaluation note that each individual's learning absorption speed in IPAS learning still varies. From the three N-Gain test results, it can be concluded that the intervention of Deep Learning-based E-LKPD in learning activities was quite effective in improving IPAS learning outcomes on the topic "My Region, My Pride" for fifth-grade students at SDN 36 South Pontianak.

Results of the Student Response Questionnaire

The response questionnaire was completed by students after using the E-LKPD in learning activities, with the following results.

Table 6. Results of Students' Responses

E-LKPD	Aspect	Maximum Score	Obtained Score	Aspect Score	Percentage %	Description
E-LKPD 1	Display	375	320	0.853	85.3	Very Positive
	Presentation	500	419	0.838	83.8	Positive
	Benefits	500	431	0.862	86.2	Very Positive
E-LKPD 2	Display	375	317	0.845	84.5	Very Positive
	Presentation	500	413	0.826	82.6	Positive
	Benefits	500	429	0.858	85.8	Very Positive
E-LKPD 3	Display	375	319	0.851	85.1	Very Positive
	Presentation	500	419	0.838	83.8	Positive
	Benefits	500	432	0.864	86.4	Very Positive

The results obtained in each aspect indicate positive and/or very positive responses. The response questionnaire results for E-LKPD 1 showed a very positive response (85.3%) in the display aspect, a positive response (83.8%) in the presentation aspect, and a very positive response (86.2%) in the benefits aspect. Meanwhile, students' responses toward E-LKPD 2 were very positive (84.5%) in the display aspect, positive (82.6%) in the presentation aspect, and very positive (85.8%) in the benefits aspect. As for E-LKPD 3, students' responses were very positive (85.1%) in the display aspect, positive (83.8%) in the presentation aspect, and very positive (86.4%) in the benefits aspect.

When viewed from the display aspect, all three E-LKPDs consistently obtained the "very positive" category, with percentages of 85.3% for E-LKPD 1, 84.5% for E-LKPD 2, and 85.1% for E-LKPD 3. These results indicate that the combination of visual elements such as color combinations, illustrative images, font types and sizes, and digital-based layouts successfully attracted students' attention from the beginning of their interaction. Attractive visual displays not only function as aesthetic enhancements for the E-LKPD but also help minimize students' extraneous cognitive load, enabling them to focus on understanding the learning material without being distracted by confusing designs.

In the presentation aspect, students provided assessments categorized as "positive," with percentages of 83.8% for E-LKPD 1, 82.6% for E-LKPD 2, and 83.8% for E-LKPD 3. These stable scores above 80% confirm that the systematic organization of materials, the accuracy of symbols and signs, the clarity of the sequence of materials and images, and the organization of tasks in the E-LKPD were considered good. A systematic presentation flow can support students' ability to think rationally and systematically in completing each stage of learning activities independently or collaboratively.

Meanwhile, the benefits aspect became the aspect with the most dominant percentage among all aspects in each E-LKPD module, with the highest score of 86.4% in E-LKPD 3, followed by E-LKPD 1 at 86.2%, and E-LKPD 2 at 85.8%, all of which were categorized as "very positive." The high responses in this aspect indicate that the E-LKPD contributed significantly and had a meaningful impact on students' learning experiences. Students felt more assisted in constructing their understanding of abstract concepts into more concrete forms due to the additional multimedia functions embedded in the E-LKPD, which may not have been found in other teaching materials they had previously used. Overall, the positive responses from the display,

presentation, and benefits aspects confirm that the three E-LKPDs were highly effective in creating an enjoyable, interactive learning environment and encouraging students' motivation and participation in the learning process.

Conclusion

Based on the results that have been presented, several conclusions can be drawn. First, the E-LKPD was developed by following all stages of the ADDIE model until completion. Second, the Deep Learning-based E-LKPD was overall considered very feasible, with the following details: E-LKPD 1 was categorized as very feasible (92.9%) in the didactic aspect, very feasible (85%) in the construction aspect, and feasible (80%) in the technical aspect; E-LKPD 2 was categorized as very feasible (91.4%) in the didactic aspect, very feasible (85%) in the construction aspect, and feasible (80%) in the technical aspect; E-LKPD 3 was categorized as very feasible (90%) in the didactic aspect, very feasible (84%) in the construction aspect, and very feasible (81.25%) in the technical aspect. Third, the E-LKPD was considered quite effective in improving IPAS learning outcomes on the topic "My Region, My Pride" for fifth-grade students at SDN 36 South Pontianak, with N-Gain scores of 62.8% for E-LKPD 1, 62.3% for E-LKPD 2, and 62.1% for E-LKPD 3. Fourth, the E-LKPD overall received very positive responses, with the following assessment details: E-LKPD 1 received a very positive response (85.3%) in the display aspect, a positive response (83.8%) in the presentation aspect, and a very positive response (86.2%) in the benefits aspect; E-LKPD 2 received a very positive response (84.5%) in the display aspect, a positive response (82.6%) in the presentation aspect, and a very positive response (85.8%) in the benefits aspect; E-LKPD 3 received a very positive response (85.1%) in the display aspect, a positive response (83.8%) in the presentation aspect, and a very positive response (86.4%) in the benefits aspect.

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