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Development of E-Handout Assisted by Canva on the Matter of Changes in Energy Forms for Grade IV Elementary School

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Abstract*—This study aims to develop teaching materials in the form of e-handouts assisted by Canva application in IPAS subject matter on changes in the form of energy for grade IV elementary school students. This research uses the ADDIE development model which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation. The subjects of this study were fourth grade students of SD Negeri 1 Gebang consisting of 12 students. Product validation was carried out by material experts and media experts, and completed with an applicability trial through a teacher and learner response questionnaire. The results obtained based on the research are the results of the validation of Canva-assisted e-handout teaching materials from both material experts concluded that the product is in the "very valid" category with a percentage of 87% and 93%. The results of validation from design experts can be concluded that, the product is in the "valid" category with a percentage of 80% from the assessment of design expert 1 and in a "very valid" category with a percentage of 95% from the assessment of design expert 2. Based on the results of the teacher response questionnaire obtained a score of 70 with a percentage of 93%, while the results of the student response questionnaire obtained a score of 68.5 with a percentage of 91%, both results of the response questionnaire were in the "very good" category. So, it can be concluded that the Canva-assisted e-handout teaching materials are valid and feasible to be applied to grade IV elementary school students.

Keywords—Canva, Development, E-Handout, IPAS

I. INTRODUCTION

Education is a series of processes carried out to develop the quality of life of individuals through curiosity and the strengthening of self-confidence [1]. The objectives of education are closely related to classroom learning. All educational objectives will be achieved through effective learning at school. The level of material absorption by students can be a benchmark for teachers to determine the success of the teaching and learning process. Appropriate learning tools that align with educational objectives are necessary to support this process. The selection of learning models and the use of appropriate teaching materials are important components that teachers must prioritize [2]. One of the key skills that teachers must master is the ability to design and develop teaching materials to support learning [3].

Teaching materials are a collection of systematically organized content designed to enable students to learn independently and in alignment with the current curriculum. The existence of teaching materials also enables teachers to deliver lessons in a more organized manner, while ensuring the achievement of all targeted competencies [4]. Teaching materials are divided into two main categories: printed and non-printed. Printed teaching materials include handouts, student worksheets, modules, books, and many others. Digital teaching materials consist of audiovisuals, e-modules, e-handouts, and materials accessed through applications or websites [5].

The development of teaching materials must be able to encourage students' interest in learning and reading, as well as provide meaningful learning. Meaningful learning will help students construct the material they have learned in relation to phenomena or events occurring in their surroundings [6]. Given the importance of teaching materials in the learning process followed by students, the researcher took action to further investigate the issues occurring at the school. This follow-up refers to the initial observation conducted by the researcher at one elementary school, namely SD Negeri 1 Gebang, specifically among fourth-grade students.

Based on the results of these observations, problems were found in the learning process, namely the lack of teaching materials to support student learning activities at school. The teaching materials available at the school were still limited to teacher and student handbooks, which only contained text material and practice questions. The appearance of the book's contents is also unattractive, as it still uses black and white paper, so some images are not clearly visible, making it difficult for students to understand some important material. Especially in the subject of Natural and Social Sciences or often referred to as IPAS, discussing the material on changes in the form of energy.

Energy transformation is the process of energy changing from one form to another. This concept aligns with the law of conservation of energy, which states that energy can change from one form to another, such as from thermal energy to kinetic energy, air to motion, and others [7]. One of the topics taught in fourth-grade IPAS is the transformation of energy forms. This topic is important because it helps students understand how energy changes into other forms, such as from electrical energy into thermal energy or light. Understanding energy transformation helps students connect scientific concepts with the technology they use daily [8]. However, for fourth-grade students at SD Negeri 1 Gebang, the material on energy transformation is difficult to understand when presented solely through written text.

Most students also show more interest in visually appealing, colorful materials compared to those filled with text. Upon review, it was found that there are no interactive digital teaching materials available in fourth grade to support the learning process. Based on this situation, it was concluded that students require varied, innovative, engaging, and user-friendly teaching materials to support their understanding during the learning process. To support this, the development of innovative technology-based teaching materials is needed. According to [9], the use of technology can be combined with teaching materials in learning to create new innovations so that the appearance of teaching materials becomes more unique and interesting.

This study offers a research product in the form of electronic teaching materials, namely e-handouts. The advancement of modern technology has certainly made it possible to create relevant teaching materials in the form of electronic handouts [3]. E-handouts contain all learning materials, so students no longer need to bring notebooks or textbooks. The available materials can be directly accessed via the provided link and opened on each student's smartphone, provided the device is connected to the internet [10]. One of the most effective learning tools is the e-handout because it is digital, easy to access, and practical. Using only a smartphone connected to the internet, students can learn anytime and anywhere [11].

E-handouts are teaching materials that contain summaries of material referenced from various relevant literature sources, then compiled in a concise and compact manner. Learning using e-handouts can foster interest and facilitate students during the learning process, whether in the classroom or independently at home [12]. E-handouts are one type of teaching material, namely handouts presented in electronic format with the aim of motivating and attracting the attention of students. This is because e-handouts can include various images, audio, animations, and videos [2].

Elementary school students typically absorb 50% of what they see and hear. The use of cartoon illustrations or animations in presenting material can serve as a means to create a more engaging learning environment, stimulate imagination, and make the process enjoyable [13]. Among the many types of applications supporting graphic design, the researcher selected the Canva application as a tool to assist in the development of this e-handout instructional material.

Canva is an online/internet-based design application commonly used for creating various visual designs. One of its uses is to help teachers design and organize more interactive learning tools for students that are easy to use [14]. [15] also state that Canva can facilitate the comprehension and understanding of lesson materials because it can present various animations, images, audio, video, graphics, and text, so that students are more focused on the materials contained in Canva because of its attractive appearance.

This study will focus on the development of e-handouts using the Canva application. The development of this product will be successful if supported by allowing students to bring their mobile phones to school and providing Wi-Fi access that can be used by teachers and students. All these criteria are in line with the conditions and readiness of the selected target school, namely SD Negeri 1 Gebang. This school is committed to improving the quality of learning. Fourth-grade students are also permitted to bring mobile phones to school if needed to support the learning process under the direct supervision of the classroom teacher.

Based on the issues and real-world conditions presented, this research aims to create a product suitable for the learning conditions at SD Negeri 1 Gebang for fourth-grade students, specifically the development of e-handouts using the Canva application for the topic of energy transformation. The topic of energy transformation, which is difficult to understand and may not be able to be demonstrated physically to students, can be visualized more clearly with the use of technology-assisted teaching materials.

This e-handout, assisted by Canva, will be developed into teaching materials equipped with digital elements such as learning materials, educational videos, assignment activities for students, and educational quizzes. The use of e-handouts is also very convenient, as they can be accessed via each student's smartphone, making them flexible and practical teaching materials. It is hoped that their implementation will enhance the effectiveness of learning, motivate students to actively engage in the learning process, and facilitate students' understanding of the presented material.

II. Research Method

This type of research uses research and development, also known as Research and Development (R&D). Research and Development (R&D) is known for its research methods that develop and produce a product, test its validity and applicability to the product that has been created. The research model used is the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation [16]. The ADDIE model emphasizes the importance of the interconnection between each stage in the development process. This model provides a structured framework that can be utilized in designing various aspects of learning, such as teaching methods, learning strategies, media, instructional materials, and other learning elements [17]. The following are the stages of the development research using the ADDIE model to produce an e-handout assisted by Canva that is suitable and aligned with the needs of the students:

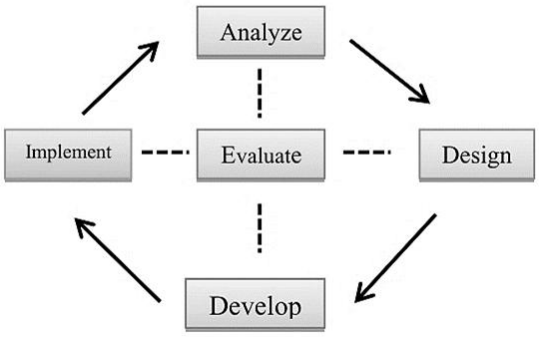

Fig. 1. ADDIE Model Development Design

The initial stage in developing teaching materials is the analysis stage, which aims to identify the needs of teachers and students for relevant teaching materials. Based on the results of initial observations in class IV SDN 1 Gebang, it was found that the limitations of teaching materials made it

difficult for students to understand complex material, especially the material on changes in the form of energy, so that interactive, concise, and easy-to-use teaching materials were needed. The second stage is design, which is the process of designing e-handouts using Canva, which are equipped with learning materials, images, videos, tasks, and quizzes. At this stage, research instruments were also prepared in the form of expert validation sheets, teacher and student response questionnaires, and interview guidelines. Furthermore, the development stage is the manufacture and refinement of products based on the design that has been designed, accompanied by validation from material and design experts. The implementation stage is the application of the product in learning and measuring applicability through student and teacher response questionnaires. At this stage, the learning environment, teachers, and students are also prepared so that learning runs effectively. The last stage, namely the evaluation stage as the last step, is useful for providing and getting value for product development in learning, which can be done in two forms, namely formative evaluation and summative evaluation. However, the stage carried out in this study only reached the stage of implementing e-handout products to research subjects.

The subjects in this study were 12 fourth grade students of SD Negeri 1 Gebang, consisting of 5 male students and 7 female students. The data collection techniques used include questionnaires, interviews, and documentation. Questionnaires were used to assess the validity by material and design experts, as well as the applicability by students and teachers. Interviews were conducted to explore additional information from fourth grade teachers related to e-handout products, while documentation was used to complement the data in the form of photos. The instruments used include questionnaire sheets, interview guidelines, and documentation.

Data analysis techniques consist of qualitative and quantitative analysis. Qualitative analysis comes from interviews and validator input, then concluded descriptively. Quantitative analysis comes from the results of expert validation questionnaires and student response questionnaires. The assessment of the questionnaire score uses a Likert scale with five assessment options, namely from score 1 means strongly disagree to score 5 which means strongly agree with the statement. The score calculation is done as follows.

Calculating the average score using the formula:

$$P = \frac{\sum x}{n} \times 100$$

Keterangan:
P = Percentage of the score sought
$\sum x$ = Number of answers given
N = Maximum or ideal number

TABLE I. CRITERIA FOR VALIDITY SCORE

Percentage Score	Criteria
0% <x≤ 20%	Very Invalid
21% <x≤ 40%	Invalid
41% <x≤ 60%	Less Valid
61% <x≤ 80%	Valid
81% <x≤ 100%	Very Valid

TABLE II. CRITERIA FOR APPLICABILITY SCORE

Presentase Skor	Kriteria
0% <x≤ 20%	Not very good
21% <x≤ 40%	Not Good
41% <x≤ 60%	Less Good
61% <x≤ 80%	Good
81% <x≤ 100%	Very Good

III. RESULTS & DISCUSSION

A. *Results*

The results of research and development of Canva-assisted e-handouts on the material of changes in the form of energy to support learning activities for grade IV elementary school students using the ADDIE model. This research uses the ADDIE development model which consists of 5 stages (Analyze, Design, Development, Implementation, and Evaluation). This development process starts from the validity test and applicability test stages. After data collection, the results of the data collection are described as follows:

1) Analysis

Problem analysis was carried out through initial observations and unstructured interviews with grade IV teachers at SDN 1 Gebang in January 2025. In the initial stage of observation and interviews, it was found that SDN 1 Gebang has used the Merdeka Curriculum. It was found that students experienced obstacles in learning IPAS subjects. Class IV finds it difficult to understand the material on changes in energy forms if they only rely on reading texts, because the material contains quite complex information and has important applications in the daily lives of students.

So far, learning activities in class IV still use the “Cerdas Tangkas” book for students and teacher's handbook, so that the reading material obtained by students is only limited to the book. The appearance of the book is also less attractive, namely still using black and white opaque paper so that there are some pictures that cannot be seen clearly. As a result, the learning process is less effective and students have difficulty in understanding the content of the lesson as a whole. Meanwhile, students tend to like material that contains many supporting images and colorful book displays compared to material that is full of text only.

Following up on the problems faced, additional teaching materials are needed in addition to handbooks at school, which can help increase students' understanding of IPAS subjects, especially the material on changes in energy forms. One of the right solutions is the development of Canva-assisted e-handouts for IPAS on the material of changes in the form of energy. In addition, the use of Canva is in line with the ability of students who have been equipped with the basics of using these applications through school programs at SD Negeri 1 Gebang who want to keep up with the times in the world of education.

Canva-assisted e-handout teaching materials can be accessed at any time via smartphones, laptops or other electronic devices as long as they are connected to the internet network so that students can learn independently. Its use is also more efficient because there is no need to print books, thus saving costs and being environmentally friendly. Therefore, the development of Canva-assisted e-handouts is

considered to be able to answer the need for teaching materials in order to improve the quality of grade IV learning at SDN 1 Gebang.

2) Design

At this stage, researchers designed the basic design of e-handout teaching materials assisted by the Canva application, including: e-handout structure preparation includes cover, identity, preface, introduction (contains learning outcomes and objectives, instructions, and material map), discussion (material, images, videos, and assignments), educational quizzes, and closing (glossary, bibliography, and compiler profile). Font selection is done by choosing fonts that are easy for students to read. The e-handout is also equipped with supporting features such as images, animations, and interesting learning videos and interactive quizzes to make learning more fun. The size used is A4 because it is in accordance with the standard of teaching materials in general.

Fig. 2. The Cover Of Canva-Assisted E-Handout

Fig. 3. The Material Page Of Canva-Assisted E-Handout

In addition to designing the e-handout, several instruments were also prepared to assess its validity and applicability. The instruments included a material expert validation sheet to assess the suitability of the material content, as well as a media expert validation sheet to assess the appearance and technical aspects of the presentation. Then a response questionnaire was also prepared for students and teachers to get responses to the e-handout developed. As a complement, an interview instrument validation sheet was also prepared to ensure that the questions in the interview after the product was tested so as to obtain optimal information..

3) Development

In the development of this e-handout, several stages are carried out to ensure the validity of the teaching material items developed through validity testing by design experts and material experts on Canva-assisted e-handout teaching materials. To ensure the level of validity of the product that has been made, Canva-assisted e-handout teaching materials need to be validated by two material validators from Bhinneka PGRI University lecturers and grade IV teachers at SD Negeri 1 Gebang, as well as two design experts from Bhinneka PGRI University lecturers. The percentage obtained shows the validation results of each design expert and material expert.

The results of material expert validation of Canva-assisted e-handout teaching materials, namely material expert 1 who scored 65 with a percentage of 87% and material expert 2 who scored 70 with a percentage of 93%. So it is concluded that the validation results of the material experts on the content of the material in the Canva-assisted e-handout fall into the very valid category. The suggestions given by material experts are to improve the use of punctuation, and add meaning or replace foreign terms to make it easier for students to understand.

TABLE III. RESULTS OF MATERIAL EXPERT ASSESSMENT

Aspect Assessment	Validator	Score	Percentage	Criteria
• Material Content • Presentation • Linguistic	Material Expert 1	65	87%	very valid
	Material Expert 2	70	93%	very valid

The results of design expert validation of Canva-assisted e-handout teaching materials showed valid criteria from the assessment of design expert 1, which obtained a score of 60 with a percentage of 80%. Design expert 2 gave an assessment in very valid criteria, namely obtaining a score of 71 with a percentage of 95%. Media experts provide advice on adding illustrations such as relevant images and animations, summarizing text content to make it denser and easier to understand, and using a relaxed and child-friendly font to make the teaching materials look more fun.

TABLE IV. RESULTS OF DESIGN EXPERT ASSESSMENT

Aspect Assessment	Validator	Score	Percentage	Criteria
• Content • Display/ Design • Utilization	Design Expert 1	60	80%	valid
	Design Expert 2	71	95%	very valid

4) Implementation

Teaching materials that have undergone improvements from the validators at the development stage, then the finished product can be developed through the implementation stage or trial directly into the field. Product trials were applied to 12 fourth grade students of SDN 1 Gebang. This field trial aims to determine the applicability of Canva-assisted e-handouts on the material on changes in energy forms that have been made.

Learners and teachers use e-handouts in the learning process in class. After learning to use the e-handout, students and teachers were given a questionnaire to assess the e-handout. The following are the results of the calculation of the student response questionnaire:

TABLE V. RESULTS OF STUDENT RESPONSE QUESTIONNAIRE

Aspect Assessment	Student	Score	Percentage	Criteria
• Interest • Readability • Ease of Use • Understanding of Material • Learning Independence	NDN	70	93%	very good
	AQAF	69	92%	very good
	AANZ	71	95%	very good
	BKB	68	91%	very good
	DCA	71	95%	very good
	DNNA	67	89%	very good
	DAR	71	95%	very good
	HFSHA	70	93%	very good
	KCF	69	92%	very good
	KRA	65	87%	very good
	MRK	64	85%	very good
	NAO	67	89%	very good
Average Total Score		68.5	91%	very good

Based on the questionnaire given, the results of the response questionnaire from students get a score of 68.5 or equivalent to a percentage of 91%, which means it is in the very good category. In addition, the teacher was also given a response questionnaire to find out the applicability of the product in learning. The following are the results of the teacher response questionnaire calculation:

TABLE VI. RESULTS OF TEACHER RESPONSE QUESTIONNAIRE

Aspect Assessment	Teacher	Score	Percentage	Criteria
• Display e-handout • Design • Presentation of material • Utilization	LAT	70	93%	very good

Based on the results of the questionnaire given, the teacher gave an assessment with a score of 70 or equivalent to a percentage of 93%, this acquisition is included in the very good category. The applicability of Canva-assisted e-handout products was also obtained from the results of interviews with teachers. The teacher stated that the e-handout was easy to understand and feasible to use, although slow internet access could be an obstacle. Thus, this e-handout is considered feasible and can be applied in learning IPAS material on changes in energy forms in class IV SD Negeri 1 Gebang.

B. Discussion

1) E-Handout Development Process Assisted By Canva

The process of developing e-handouts using Canva employed the ADDIE development model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. During the analysis stage, the researcher conducted observations in the fourth grade of SD Negeri 1 Gebang and found that the teaching materials used were still uninteresting, consisting only of Cerdas Tangkas books with unattractive designs. Students tended to prefer materials with pictures and colors. Additionally, the researcher analyzed the need for teaching materials and the characteristics of the students as the basis for development.

The design stage was carried out by designing the structure of the e-handout content, selecting fonts, supporting features, and teaching material sizes. The Canva application was chosen because it provides various templates that make it easy to create attractive and interactive designs. In addition, several instruments were also developed to assess validity and applicability. These instruments include expert validation sheets for content and design to test validity. Participant and teacher response questionnaires were used to assess the applicability of the developed e-handout instructional materials.

In the development phase, the instructional materials were created according to the designed layout. The e-handout instructional materials were then validated by two content experts and two design experts. Based on the results of the expert material and design validation questionnaires, quantitative and qualitative data were obtained as a guide for the improvement or revision process of the product before it was tested. This expert validation aims to ensure the suitability and quality of the developed product.

The implementation of the e-handout teaching materials was carried out after the validation process by subject matter experts and design experts. After being validated, the researcher conducted a field test in the fourth-grade class at SD Negeri 1 Gebang. In this test, students used the e-handout during the learning process to determine the extent to which the teaching materials were applicable in learning activities. After the trial was conducted, the researcher distributed questionnaires to the students and fourth-grade teachers to measure their responses. In addition to the questionnaires, the researcher also conducted interviews with the class teachers to obtain more in-depth information about the strengths and weaknesses of the e-handout teaching materials that had been used.

2) Validity of E-Handout Assisted by Canva

To ensure the validity of the developed teaching materials, design experts and subject matter experts conducted validity tests on the Canva-assisted e-handout teaching materials. This validation was carried out before the field trial was conducted. The validation was performed by validators who are competent in their respective fields. The percentages obtained indicate the validation results from each design expert and subject matter expert.

The results of the subject matter experts' validation of the Canva-assisted e-handout teaching materials were as follows: subject matter expert 1 obtained a percentage score of 87% and subject matter expert 2 obtained a percentage score of 93%. The results of the subject matter experts' validation of the Canva-assisted e-handout teaching materials fell into the highly valid category. This validity assessment is based on several important factors, including language, presentation, and linguistic aspects. The content aspect includes the material presented in the teaching materials, which is assessed as being

in line with the Learning Outcomes, Learning Objective Sequence, and Learning Objectives to be achieved. The content is consistent with the material from the Cerdas Tangkas textbook, and the explanations are easy to understand and remain on topic. Additionally, according to the subject matter experts in the presentation aspect, the structure of the content is considered coherent, systematic, and easy for students to understand. From a linguistic perspective, the language used is easy to understand and appropriate for the developmental level of elementary school students.

The results of expert validation of the e-handout teaching materials assisted by Canva show a valid category from expert designer 1 with a score of 80% and expert designer 2 giving a rating in the highly valid category with a score of 95%. This validity assessment covers several aspects, namely content, appearance/design, and utilization. According to the design experts, in terms of content, the teaching materials were assessed as containing relevant, accurate, and concise information. In terms of appearance or design, the use of images, animations, layout, colors, and fonts was assessed as good and attractive. Meanwhile, in terms of utilization, the teaching materials were assessed as easy to access and use in learning activities, both independently and with teachers, provided they are connected to the internet.

3) Applicability of E-Handout Assisted by Canva

The applicability of Canva-assisted e-handouts was obtained through a response questionnaire distributed to the research subjects, namely fourth-grade students. It was also obtained through a response questionnaire from interviews with fourth-grade teachers. The response questionnaire contained 15 statements and was given to 12 students and 1 teacher at SD Negeri 1 Gebang. Additionally, teachers were also asked for their opinions through interviews containing 12 questions.

Based on the results of the questionnaires distributed, teachers rated the e-handouts with a score of 70, equivalent to a percentage of 93%, which falls into the "very good" category. Meanwhile, the questionnaire responses from students obtained a score of 68.5, equivalent to a percentage of 91%, which also falls into the very good category. The applicability of the Canva-assisted e-handout product was also obtained from interviews with teachers. The interview results showed that all lesson materials were complete, clear, and easy for students to understand. However, if the internet speed is slow, the time required to access the e-handout page is quite long. He also opined that the Canva-assisted e-handout teaching material product is suitable for use in learning in the fourth grade of SD Negeri 1 Gebang.

IV. Conclusion

The e-handout teaching materials assisted by Canva were developed using the ADDIE model through five stages: Analysis, Design, Development, Implementation, and Evaluation. The development process was carried out to address the needs of fourth-grade students at SD Negeri 1 Gebang in understanding the IPAS subject, particularly the material on energy transformation. The product was validated by subject matter and design experts, showing a validity rating of "Very Valid." Subject matter expert validation categorized the product as "Very Valid" with scores of 87% and 93%, while design experts rated the product as 'Valid' to "Very Valid" with scores of 80% and 95%. The product's applicability was also rated as "Very Good" based on teacher and student response surveys, with scores of 93% and 91%, respectively. Based on the validity results, it can be concluded that the Canva-assisted e-handout developed is very valid and suitable for use in learning. Additionally, the product's applicability in the teaching and learning process was rated very good by teachers and students, making this e-handout highly practical and suitable for use in learning to aid understanding of the material on energy transformation in Grade IV at SD Negeri 1 Gebang.

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