# Development of Electronic Student Worksheets Based on Character Education in Science Learning in Primary Schools

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**Abstract.** Character education is an essential component in building a generation that is intellectually intelligent, moral, and ethical. However, the implementation of character education in elementary schools is often still theoretical and less integrated in learning. In science subjects, which emphasize scientific exploration and critical thinking, learning media is needed that not only supports the understanding of concepts but also instills character values. For this reason, the development of Electronic Student Worksheets (E-LKPD) based on character education is a relevant innovative solution. This research is to develop E-LKPD based on character education that is in accordance with the needs of science learning in elementary schools and test the feasibility and effectiveness of E-LKPD in improving the understanding of science concepts and internalizing character values in students. This study applies the Research and Development method with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. The stages of the research include: Analysis: Identification of the needs of teachers and students for character education-based learning media; Design: Preparation of E-LKPD design based on character education with the integration of values such as honesty, responsibility, and cooperation; Development: E-LKPD prototyping using interactive educational design software; Implementation: Trial of the product in elementary schools by involving students and teachers as research subjects; Evaluation: Analysis of the feasibility and effectiveness of E-LKPD based on the results of expert validation (media and materials), user responses, and student learning outcomes. The results of the media expert validation test with a percentage of 85% or with very feasible criteria, the validation of material experts with a percentage of 87.2% or with very feasible criteria, The results of user responses show results with a percentage of 90% or with the very good category and student learning outcomes obtained an average score of 87.8 with the very good category. Based on these results, it shows that E-LKPD is very feasible to be developed and worthy of being used as a tool that helps the learning process and with this E-LKPD, it is hoped that science learning in elementary schools can be more interactive, relevant, and support the strengthening of students' character..

**Keywords:** e-LKPD, Development, Character education.

# 1 Introduction

In the era of rapid technological advancement, it is very important to convert LKPD into electronic format (E-LKPD) to support the independent learning process [1]. This is in line with the development of the times that are currently moving into the era of Society 5.0, which hints at the increasing interaction of humans with technology and has an impact on the challenge of interoperability in various aspects of life[2]. This era of transformation requires students and students to have the ability to face the problems of this century, so that 21st century skills are very important to master [3].

Many factors affect the quality of education, including teachers, students, approaches, and learning models used. Teachers have a big role in the teaching and learning process [4]. Therefore, various efforts to improve the quality of education are very important to improve the quality of education today [5]. The job of teachers is not easy because they have to adapt to the rapid changes in the school environment, especially those driven by the advancement of science and technology. Teachers are also required to master technological literacy and digital skills as an integrated part of 21st century learning[6].

Teaching and learning activities organized by teachers must combine the use of technology, basic scientific knowledge, and teaching skills. Teachers must be able to adapt to the curriculum and use their imagination to teach creatively [7]. It is hoped that the existence of technology in the world of education will provide significant support in teaching and learning activities, for example to find references, assign assignments, attend students and teachers, and other aspects. TPACK (Technological Pedagogic Content Knowledge) is one of the approaches that combines educational systems, technology, and applications in learning [8].

In practice, the learning process must take place in a communicative and interactive manner between teachers and students. In order for science learning objectives to be achieved, an effective learning process and good communication between students and teachers are needed. However, in reality, learning today still tends to be teacher-centered[9], so students tend to be passive and less involved in solving or discovering learning problems [10]. This is one of the factors that decreases students' motivation to learn. In addition, there are not many teachers who are creative in designing learning tools, such as LKPD, and have not been able to take advantage of technological advances to support the teaching and learning process. In fact, e-LKPD in education is needed because sophisticated technology requires teaching materials in digital form. Through e-LKPD, teachers can utilize environmental media to make learning more effective while providing real experiences to students [11]. This is very relevant to science learning which is a teaching and learning process that focuses on understanding and applying scientific concepts in the fields of physics, chemistry, biology, and the environment [12].

The approach to science learning at the elementary school level also emphasizes providing hands-on learning experiences to students and developing science process skills that can be integrated in e-LKPD. This approach is very much in line with the developmental characteristics of elementary school-age children who are full of curiosity and have high enthusiasm in exploring the world around them through technology [13]. Thus, the use of e-LKPD and the integration of technology in learning is an important step to realize effective, interactive, and relevant education

## 2 Method

This type of research is research and development. Development research is research that is designed in a structured and systematic manner to develop a product through certain stages and evaluations to test the level of validity, practicality, and effectiveness in using the Research and Development (R&D) method with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. The stages of the research include 1) Analysis: Identification of the needs of teachers and students for character education-based learning media; 2) Design: Preparation of E-LKPD design based on character education with the integration of values such as honesty, responsibility, and cooperation; 3) Development: E-LKPD prototype creation using interactive educational design software; 4) Implementation: Product trials in elementary schools by involving students and teachers as research subjects; 5) Evaluation: Analysis of the feasibility and effectiveness of E-LKPD based on the results of expert validation, user responses, and student learning outcomes.
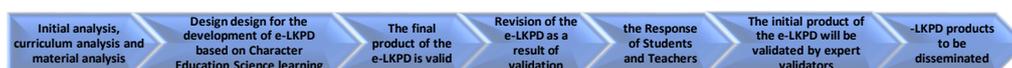


**Fig. 1**. Research Design

## 3 Results and Discussion

### 3.1 Research Results

This development research is carried out using the ADDIE model which begins with Analysis, planning, development, implementation and evaluation. At this stage of analysis, the researcher explores the information needed to develop e-LKPD products, including analyzing student needs, curriculum, facilities and infrastructure, and teaching materials. The planning stage is the stage of designing e-LKPD products based on the information obtained in the previous stage, namely analysis. This stage includes determining the theme and application used. The purpose of this stage is to determine the design and components of the media to be used. The development stage is the third stage that is carried out starting from preparing devices and supporting media such as videos from youtube, canva and refined on Liveworksheet.com site so that it can be accessed through the internet or electronic network.



**Fig. 1**. e-LKPD Design

At this stage, a feasibility test was also carried out by media and material experts, after which a trial was carried out on a group of students. After the e-LKPD is declared feasible, it can be used in learning. The next stage is implementation, namely implementing the product and at this stage an assessment is carried out to determine the effectiveness of e-LKPD on student learning outcomes. From the student learning outcomes obtained, there is an increase in grades with the method used previously marked by an increase in learning outcomes in students. The last stage is evaluation which aims to minimize errors in the developed product and improve if there are still technical errors in the e-LKPD.

The results of the research on the development of e-LKPD based on character education in science learning in elementary schools were tested by questionnaire validation by media experts and material experts, while the feasibility of e-LKPD was obtained from questionnaire sheets and student learning outcomes. According to Arikunto (2012), determining the percentage value of validation results using formulas and the results obtained are categorized as follows:

$$\text{Value} : \frac{Total\ score}{maximum\ score}\ x\ 100\% \tag{1}$$

**Table 1**. Validator eligibility categories

| No | Score (%) | Criterion |
|----|-----------|-----------|
| 1 | 81-100 | Highly Worth It |
| 2 | 61-80 | Proper |
| 3 | 41-60 | Quite Decent |
| 4 | 21-40 | Less Worthy |
| 5 | 1-20 | Very Less Worthy |

The following are the results of research on the development of e-LKPD based on character education in science learning in schools based on the results of validation by media experts and material experts.

**Table 2.** Media Expert Validation Results

| Aspects | Aspect Score | Maximum Score | Percentage (%) | Information |
|---------|--------------|---------------|----------------|-------------|
| Text design | 20 | 25 | 80 | Highly Worth It |
| Image design | 22 | 25 | 88 | Highly Worth It |
| Language | 26 | 30 | 86 | Highly Worth It |
| Total Score | 68 | 80 | 85 | Highly Worth It |

Based on table 2 above, the validation results of media experts are 85% with very feasible criteria. This ensures that e-LKPD based on character education in science learning in elementary school is very feasible to be developed and used in the teaching and learning process

in schools. Validation was carried out by media experts with the aim of evaluating e-LKPD based on character education. This is to see the feasibility of media in the form of relevance, content, font size, design, and layout.

**Table 3.** Subject matter expert validation

| Aspects | Aspect Score | Maximum Score | Percentage (%) | Information |
|---|---|---|---|---|
| Suitability of the material with learning objectives | 27 | 30 | 90 | Highly Worth It |
| The material presented supports character education | 25 | 30 | 83,3 | Highly Worth It |
| Accuracy of questions in e-LKPD | 26,5 | 30 | 88,3 | Highly Worth It |
| Total Score | 78,5 | 90 | 87,2 | Highly Worth It |

Based on table 3 above, it shows that the validation results of subject matter experts are 87.2% with very feasible criteria. This ensures that e-LKPD based on character education in science learning in elementary school is very feasible to be developed and used in the teaching and learning process in schools. The assessment of material experts has the purpose of assessing the e-LKPD from the aspect of material suitability, supporting character education and the accuracy of the questions in the e-LKPD with the existing material.

The following are the results of the student response questionnaire with the application of character education-based e-LKPD in science learning in elementary school:

**Table 4.** Student responses and student learning outcomes

| Respondents | Total Score | Maximum Score Amount | Percentage (%) | Learning Outcomes |
|---|---|---|---|---|
| 1 | 42 | 50 | 84 | 88 |
| 2 | 45 | 50 | 90 | 87 |
| 3 | 47 | 50 | 94 | 92 |
| 4 | 43 | 50 | 86 | 90 |
| 5 | 49 | 50 | 98 | 88 |
| 6 | 44 | 50 | 88 | 93 |
| 7 | 49 | 50 | 98 | 83 |
| 8 | 50 | 50 | 100 | 87 |
| 9 | 41 | 50 | 82 | 85 |
| 10 | 47 | 50 | 94 | 88 |
| 11 | 48 | 50 | 96 | 93 |
| 12 | 44 | 50 | 88 | 90 |
| 13 | 43 | 50 | 86 | 84 |
| 14 | 46 | 50 | 92 | 89 |
| 15 | 43 | 50 | 86 | 86 |
| 16 | 41 | 50 | 82 | 84 |
| 17 | 43 | 50 | 86 | 86 |
| Average | | | 90 | 87,8 |

Based on the data in table 4 regarding student responses and student learning outcomes using character education-based e-LKPD in science learning in elementary schools, it shows excellent results and is recommended to be used during the learning process. This trial aims to analyze

the percentage of feasibility in e-LKPD so that it is obtained by 90% or very feasible to be developed.

Learning tools based on e-LKPD with an emphasis on character education on students provide a good change for a learning that so far teachers have still used printed LKPD by relying on paper. With the existence of e-LKPD, it is hoped that learning will be easier and more efficient both for teachers during assessment and students when working on it. In the global era, students understand everything faster when it can be accessed digitally than conventionally. Therefore, e-LKPD is specially designed for learning by being equipped with features such as videos, text, images and materials that can be accessed anywhere. E-LKPD is a sheet that is done through a computer, laptop or smartphone.

## 3.2 Discussion

The development of e-LKPD based on character education in elementary school science learning based on the applicable curriculum and adjusted to the needs of students that have been adjusted to the characteristics and surrounding environment. The product produced in this study is e-LKPD based on character education in elementary school science learning. This E-LKPD has advantages including being more efficient and practical for teachers and students. This e-LKPD can be made interactively easily and students can learn independently using various visual media, such as images, videos and audio. In addition, the material presented can be restudied. The development of e-LKPD based on character education in elementary school science learning in this study uses the ADDIE development model. The initial stage carried out by researchers is at the Analysis stage. At this stage, an analysis was carried out with interviews and the distribution of questionnaires to teachers and students to analyze the need for teaching materials based on interviews with elementary school teachers, it is known that schools are still in the early stages of implementing educational technology and are still using paper-based LKPD. Meanwhile, the results of the questionnaire showed that students had a high interest in teaching materials that were more interactive and technology-based. Therefore, the development of e-LKPD based on character education in elementary school science learning is expected to help students learn independently, think creatively and improve their understanding of science learning materials. The next step is to analyze the teaching materials used in science learning. This analysis aims to ensure that the e-LKPD material is in accordance with the independent curriculum and the flow of learning objectives (ATP).

The design stage is to prepare a draft e-LKPD for elementary school science learning. This draft e-LKPD is the initial stage that is the basis for the development of e-LKPD. At this stage, the e-LKPD will be compiled and includes the main components in the e-LKPD, namely: e-LKPD cover (initial display that reflects the identity of the e-LKPD), identity information (containing the student's name, subject, class and date of work), Main menu (main navigation to access various features in e-LKPD), learning materials (powerpoint, youtube videos, and ebooks) and practice question menu (consisting of matching, multiple-choice, essay, etc.). This structure is designed to make e-LKPD more interactive, systematic and support the independent science learning process. The development stage of the e-LKPD developed, the format starting from PDF, JPG, PNG will be converted into an interactive e-LKPD using a liveworksheet application. In this process, the researcher made improvements by adding various learning support features, such as youtube videos that can be viewed directly in the relevant e-LKPD as an additional resource to deepen student understanding as well as e-books and PPT as accompanying teaching materials. After the editing process is completed, the researcher then publishes the e-LKPD

through a liveworksheet to obtain an accessible link. Furthermore, the e-LKPD website link that has been developed is shared with validators of material experts and media experts for a feasibility test. The validator provides an assessment of three aspects of the assessment, namely: the feasibility aspect of the content, the aspect of presentation, and the language feasibility aspect of the e-LKPD that has been developed. Based on the results of the assessment conducted by the material validators, the average percentage of overall material feasibility was 92.5% which was categorized as "very valid". The full results of the assessment can be seen in Table 4. Meanwhile, the results of the media feasibility test conducted by one validator showed that the developed e-LKPD obtained an average percentage of 88.5% with the category "Very Practical". The results of the media validator assessment in more detail can be seen in Table 5. This practicality test measures three main aspects, namely the aspect of interest, the material aspect, and the language aspect. These results show that the interest aspect obtained an assessment score of 87% with the category "very practical", the material aspect obtained an assessment score of 84% with the category "very practical". And the language aspect obtained an assessment score of 88% in the category of "very practical".

After conducting a practical test of e-LKPD on a small scale, the next stage is to test the effectiveness of e-LKPD. The trial of this product was carried out in a large group, namely in class V by involving 25 students as research subjects. The purpose of this stage is to analyze the effectiveness of the e-LKPD that has been developed. In the process, e-LKPD is distributed to students and then a post-test is carried out to measure learning completeness based on the use of e-LKPD. The results of the post-test analysis showed that all students obtained scores above 81 Thus, as many as 25 students managed to achieve scores that met the limit of the learning goal achievement criteria (KKTP), with a graduation percentage of 85.5%. This percentage is classified as "very good", so it can be concluded that this e-LKPD is effectively used in learning, which can be seen from the level of learning completeness of students who have met (KKTP). The results of the study concluded that the development of e-LKPD based on character education in elementary school science learning was declared valid and suitable for use. Therefore, this learning media can be used as an interactive and effective teaching material for students in understanding concepts and supporting independent learning and direct feedback, this e-LKPD provides a more varied learning experience and increases student involvement in learning. The last stage is the implementation (dissemination) of e-LKPD developed by researchers through the validation and trial stages by distributing it to students. However, this distribution was limited to only one class that was the subject of this study. e-LKPD is based on character education in elementary school science learning that has been developed through analysis. The results of research from material and media experts, responses from teachers and students, show that this learning media meets the criteria for validation, practicality, and effectiveness. Based on the results of the analysis, this e-LKPD was declared suitable for use as teaching materials or exercises for students who support science learning in elementary schools. With an interactive design and features that are responsive to the needs of students, this e-LKPD not only helps in understanding science concepts more systematically, but also increases student involvement in the learning process. Therefore, it can be concluded that the e-LKPD developed is a valid, effective, and practical learning medium to be used in learning activities. Thus, this study strengthens the evidence that the development of e-LKPD designed in accordance with learning needs can be a matter of interactive exercises and can be a valid, effective, and practical medium in improving students' understanding of science concepts in elementary schools. This is also because the e-LKPD developed has advantages, such as: This E-LKPD can be used on

all types, smartphones, laptops, and computers. This E-LKPD can be accessed anytime and anywhere.

This E-LKPD can be easily disseminated just by spreading the link through social media such as WhatsApp, Classroom, Email. This e-LKPD is equipped with various learning resources such as learning videos in ebook format, PowerPoint, and Youtube links, which can be accessed directly in the application without the need to switch to the YouTube platform separately. E-LKPD also integrates learning with entertainment in the form of educational games to make the learning process more interesting and interactive for students. This E-LKPD is designed with an attractive color combination, so that it can increase visual appeal and strengthen students' focus in the learning process. In the development of e-LKPD based on character education in elementary school science learning, there are several weaknesses as follows: The scope of this research trial is limited so that the research results are relatively not able to represent the needs of students and, in general, this research is only conducted in the city of Deli Serdang. To gain access to additional features that are more interactive and comprehensive, the use of the paid (premium) version is required. It is hoped that the development of e-LKPD can take advantage of more diverse and complete features so that the content of e-LKPD becomes more interactive. The use of a relatively large internet connection can be an obstacle for educators with limited or unstable internet access. Therefore, it is hoped that there will be the development of offline features on e-LKPD so that students can still learn independently without relying on an internet connection.

## 4  Conclusion

Based on the results of data analysis conducted in this study, it can be concluded that the development of e-LKPD based on character education in science learning in elementary schools uses the ADDIE model. The validation results show that this e-LKPD is categorized as very feasible, very practical, and very effective for use in learning in elementary schools. The feasibility of e-LKPD developed from the aspect of material feasibility includes, the feasibility of the content obtained a score of 92.3% with the category of "very feasible". The feasibility of the presentation received a score of 95% with the category "very feasible". Language proficiency reaches 96% with the category of "very feasible". In addition, the media's feasibility obtained a score of 94% which was categorized as "very valid". The practicality analysis was carried out through a small group trial by collecting respondents from elementary school students in grade V. Students' responses showed that the aspect of interest was 91.6% in the category of "very practical". The language aspect is 91.6% with the category "very practical"The language feasibility aspect is 83.3% with the category "very practical". Meanwhile, students' responses to the aspect of interest reached 82.6% with the category "very practical", the language aspect of the material reached 80.5% with the category "practical", and the language aspect received a score of 82.9% with the category of very practical. The effectiveness of the e-LKPD developed was tested through large group tests by applying the product in learning and conducting post-tests. The results of the analysis showed that the student graduation rate reached 85.7% which was classified as "excellent".

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