



Igniting Curiosity: E-LKPD with a Scientific Twist on Circle Concepts

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ABSTRACT

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E-LKPD, Scientific Approach, Circle Material

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The purpose of this study is to develop E-LKPD with a scientific approach to increase students' interest in learning circle material at MI Al Hidayah Mangli Jember which is valid. Judging from the current development of education, educators are required to be able to innovate in making and creating various learning teaching materials. However, based on observations, the learning teaching materials used have not been effective and have not been able to accommodate students to be active in the learning process. The development of Student Worksheets (E-LKPD) with a scientific approach to circle materials to increase students' interest in learning is an effort to overcome problems found in the learning process. This is also to help students better understand the learning material, especially circle material, because it is a difficult material to raise. The development of this E-LKPD uses the R&D stages of the ADDIE model, namely *Analysis, Design, Development, Implementation, and Evaluation*. The subjects of this research consist of: *First*, 3 validator lecturers, namely: media experts, material experts, and linguists. *Second*, one mathematics teacher and 30 students of class VI MI Al Hidayah Mangli Jember. The data collection instruments used are teacher interview questionnaires, student observation questionnaires, validity questionnaires, and practicality questionnaires. The validity test result of the e-LKPD is 90% with a very valid category and the result of the practicality test is 91% with a very practical category. So that the e-LKPD developed has met the criteria and can be used in the mathematics learning process.

INTRODUCTION

Education is a deliberate and well-thought-out effort to regulate the practice and learning environment so that each participant actively improves his or her skills to acquire the necessary spiritual strength in the form of self-confidence, self-control, ethics, intelligence, high ethics, and mastery (Saadi et al., 2022; Arifin, 2024; Ridlo & Yanti, 2023). Based on this reality, education in Indonesia continues to undergo changes and updates from year to year gradually due to the development of science and technology which has caused several shifts in the learning process, one of which is that learning teaching materials that

are usually presented on paper or printed can be changed and presented online (Daheri, 2023; Purwanto, 2023; Maulidia, 2023).

The learning process in the 21st century emphasizes the occurrence of student-centered learning, which means that in the learning process, students are used as learning subjects so that they can increase students' activeness, interest, and potential (Harefa et al., 2024; Zuhdi et al., 2024). However, based on the results of teacher observations, the learning process that occurred at MI Al Hidayah Mangli Jember is still teacher-centered so students are less active in the learning process, and this causes the attitude aspect in the applicable 2013 curriculum to not be achieved. Therefore, a student-centered learning approach is needed. One of the learning approaches that can increase the involvement of students actively, critically, and independently in the learning process is the scientific approach.

The scientific approach is a learning approach that not only requires students to be the center of the learning process but also requires students to have high thinking skills (Sinaga, 2023). A scientific approach to learning will be easier to implement if learning teaching materials are available, therefore integrating a scientific approach into learning teaching materials is one of the efforts that can be made by teachers to help the application of scientific approaches (Ulandari et al., 2024). Based on this, there is a need for learning with a scientific approach through several supporting methods so that learning runs effectively, one of which is educators providing teaching materials. So teachers are required to be able to make adjustments and changes in the learning process, as well as be able to innovate in making and creating various teaching materials.

Teaching materials are part of learning resources which are a combination of software (teaching materials) and hardware (learning tools) (Astuti et al., 2024). The use of appropriate and planned learning teaching materials by teachers can help students understand learning materials and create effective and fun learning conditions (Firdaus et al., 2023). To create effective and exciting learning conditions, especially in mathematics subjects. Mathematics is taught at all levels of education, from elementary to university, Mathematics is an essential foundation that underpins the advancement of various aspects of life (Nandiyanto et al., 2023). The development of mathematical life, including fun learning resources. Fun math learning can be presented with interesting learning methods. So, mathematics is a science that has an important role in life and is the basis of all science. In addition to the fact that mathematics is beneficial in every aspect of life, the most important thing is to learn it (Kusmaryono et al., 2024) However, by studying mathematics, students will get used to thinking rationally, analytically, and critically, and be able to increase their creativity. Math practice in everyday life can help in learning to be tolerant, and correct in solving math

problems, learning to use calculations to find the right answer, and improving skills. Confidence to do a good job, be polite, and behave well, and can be used to support talks, such as calculating profits and losses (Carney, 2021).

Elementary school students must learn mathematics because it fosters essential reasoning and creative skills, which are crucial for thriving globally. Creativity is a universally needed skill, and open research can enhance deep thinking among students (Kafiar et al., 2023). This approach, first implemented in Japan from 1971 to 1977, involved Japanese researchers developing an assessment system to better measure students' high-level mathematical skills and ideas, starting with advanced students engaging in open mathematics that included multiple "open" or "incomplete" correct answers (Loviana, 2024). By giving students the freedom to find various solutions and answers to problems, this method aims to boost their interest in learning. The open-ended technique presents students with cases that can be solved in multiple ways, encouraging innovative problem-solving (Kartikasari & Usodo, 2022). Open learning provides learners with more opportunities to participate, share their thoughts, and apply their mathematical knowledge and skills in real life. This real-world application excites students by providing feedback and data and enhances their problem-solving experience.

Based on the results of observations and interviews with grade 6 mathematics teachers, some problems often arise, namely the lack of interest of students in understanding mathematical concepts, this is due to the lack of interest in the learning process so that the learning outcomes of students are not optimal. Efforts to solve student learning problems so that teaching materials need to be provided that can make students more active in the learning process. One of the teaching materials that can be used is the development of E-LKPD with a scientific approach to circular materials. This is because E-LKPD received a positive assessment from students. After all, the operation of the module is very easy and the elements of music and animation are considered to be able to remind students of motivation, interests, and learning activities (Ranindita et al., 2024).

Previous research has stated the need to develop E-LKPD with a scientific approach to increase students' interest in learning Mathematics. A study conducted by Mayang Aprilia Trissa, Sa'diatul Fuadiyah, Syamsurizal, and Ria Anggriyani in 2024 regarding the Development of Electronic Education Worksheets (E-LKPD) with a scientific approach to coordination system materials for students is an effort to overcome problems found in the learning process (Trissa et al., 2022; Sanjani, 2024). As well as helping students better understand learning materials, especially coordination system materials, because they include materials that are considered difficult (Faiz et al., 2023). Until the results emerged the results of the e-LKPD validity test were 90.3% with the very

valid category and the results of the practicality test were 91.4% with the very practical category. So that the e-LKPD developed has met the criteria and can be used in the mathematics learning process.

Furthermore, research by Siti Khadijah, Noor Fajriah, and Budiarti in 2022 stated that to overcome this with interesting and interactive teaching materials, one of which is the development of LKPD in electronic form which is associated with the wisdom of local culture in South Kalimantan. (Khadijah et al., 2022) Then according to the scores given by the three experts, an average score of 3.51 was obtained, meaning that E-LKPD is a valid category and can be used in mathematics learning.

In addition, research by Titus Prayoga, Gusti Ngurah Sastra Agustika, and Ni Wayan Suniasih in 2022 stated that there were problems with the ineffective use of conventional LKPD and the inhibition of the activity of class I students in the online learning period. (Prayoga et al., 2022) So that the results of the effectiveness test were obtained that the pre-test had an average score of 65.1 with moderate qualifications and the post-test had an average score of 90.4 with very high qualifications.

From some of the previous research results above, as well as the existence of this phenomenon, the institution needs to find that at MI Al Hidayah in the Development of E-LKPD during its learning activities, one of the materials included in the E-LKPD is the Circle material which is considered difficult so it requires teaching materials in the form of E-LKPD to increase students' interest in learning. This of course needs to be implemented well in the institution to increase students' interest in learning to support the value of the students themselves.

Thus, the novelty of this study focuses on the development of E-LKPD using a scientific approach to circle material to increase students' interest in learning at MI Al Hidayah Mangli Jember, because it is clear that there is an application of E-LKPD during the learning of Circle material which is developed effectively and efficiently, precisely the material that is included is circle material that is considered difficult by students then through the application of E-LKPD with Using this scientific approach can increase students' interest in learning.

METHOD

The type of research used in this study is R&D (research and development) using the ADDIE model developed by Dick and Carry which consists of five stages, namely: Analysis, Design, Development, Implementation, and Evaluation (Waruwu, 2024).

At the Analysis stage, it is carried out with the aim of finding out the basic problem so that it can be clarified whether the problem requires effort to resolve it. (Suryawan & Ratnaya, 2023) At this stage the researcher carries out an analysis to obtain a temporary picture of the product to be developed, for this reason Several stages are needed, namely, needs analysis, student analysis and teaching materials analysis. The Design stage is carried out before carrying out media development. In this third stage, the researcher designed the general E-LKPD framework and analyzed the learning material that would be included in the E-LKPD card. At the Development stage, teaching materials are seen from the physical, design and material aspects. At the Implementation stage, a trial phase is carried out after the card teaching materials have been validated and revised by a team of teaching materials and material experts. In this trial phase, students fill out a student questionnaire to find out students' interest in using E-LKPD teaching materials. Apart from that, this trial was carried out to see the extent of students' interest in learning material about Indonesia's cultural riches before and after using E-LKPD teaching materials. the. In the final stage of the ADDIE research, namely face-to-face evaluation (Evaluation) which is carried out by researchers to determine the quality of the E-LKPD being developed. (Wijaya & Hidayat, 2022) At this stage it is carried out to determine the suitability of the E-LKPD teaching materials, with the data The data obtained is used to improve the product being developed.

There are two types of data used in this study, namely qualitative and quantitative descriptive data. The qualitative descriptive data collection instrument was obtained through interviews conducted to find out or analyze student needs, characteristics of student learning styles and the needs of the teaching materials used. The results of this qualitative data analysis are obtained through the process, interviews with teachers and students, as well as observations made during the learning process at school as well as assessments or information provided by validators. The questions in the interview process are made according to the needs of the analysis carried out in the research.

In the quantitative descriptive data collection instrument, it is carried out with the aim of determining the feasibility of the E-LKPD media through the score obtained from the validation questionnaire and response questionnaire. The validation questionnaire consists of the validation of media experts, material experts and learning experts. The response questionnaire consists of teacher and student response questionnaires. In this expert validation instrument, there is an assessment that measures the validity of the media, E-LKPD material developed through criticism, suggestions and the perspective of experts. With calculations like the one below. With a percentage of $\geq 69\%$, the E-LKPD media using the mind

mapping learning model for Mathematics students is declared valid as a student learning medium.

$$Validation (V) = \frac{Total\ Scor\ Validation}{Total\ Scor\ Maximum} \times 100\%$$

Table 1. Validation Result Percentage

Validity Criteria	Validity Level
85% - 100%	Highly Valid
69% - 84%	Valid
53% - 68%	Quite Valid
36% - 52%	Less Valid
20% - 35%	Invalid
0% - 19%	Highly Invalid

Sumber: Sugiono (2019)

The analysis of the response questionnaire data was calculated to determine the practicality of the E-LKPD teaching materials developed by the researcher, in its collection using a likert scale with the calculation below. With a percentage of $\geq 69\%$, E-LKPD teaching materials in Mathematics lessons are declared interesting and practical to be used as a learning medium for students.

$$Persentase (P) = \frac{f}{N} \times 100\%$$

Information:

F : The total score of the overall score obtained

N : Total maximum score

Valution	Criterion
81% - 100%	Strongly Agree
61% - 80%	Agree
41% - 60%	Simply Agree
21% - 40%	Disagree
0% - 20%	Strongly Disagree

Sumber: Sugiono (2019)

FINDINGS AND DISCUSSION

The results of this research are in the form of an Electronic Student Worksheet (E-LKPD) which was developed using the ADDIE method as previously stated. The ADDIE method, which stands for Analysis, Design, Development, Implementation and Evaluation, provides a structured and systematic approach in making E-LKPD. At the analysis stage, researchers identify specific needs and learning objectives. At the design stage, they plan the content and layout of the E-LKPD. The development phase involved creating

digital worksheets, incorporating multimedia elements to increase engagement and understanding. The implementation is the application of E-LKPD in a real educational environment, thereby allowing practical use and observation. Finally, the evaluation stage includes collecting feedback and assessing the effectiveness of E-LKPD in achieving its educational goals. This approach ensures that E-LKPD is pedagogically sound and user-friendly, ultimately aiming to improve learning experiences and outcomes for students.

Analysis

At this stage, adjustments are made to teaching materials that are prepared in accordance with the curriculum, characteristics, and tendencies of students' learning styles. In this case, the selection of teaching materials is carried out to consider the suitability of the content of the material with the design of the E-LKPD teaching materials developed. In this case, the researcher conducted an analysis of student needs, characteristics of student learning styles and analysis of the materials used (Marlina & Wiyono, 2023). From the results of observations and interviews conducted at MI Al-Hidayah Mangli in the learning process of grade VI students are very bored when mathematics learning is taking place, it is seen when the learning process of students feels very bored and because learning is so monotonous. The analysis of teaching materials is carried out to adjust teaching materials with learning media which are then arranged in accordance with the curriculum, characteristics and tendencies of students' learning styles. Based on the results of the interview, it was found that the media used before him was in the form of posters attached to the wall and it did not match the tendency of students' learning styles who preferred the learning process while playing. This is corroborated by the statement of one of the grade VI students named Satria Willy that he is bored with learning mathematics because he only sees the material and assignments in the package book and LKS, so according to him what is interesting is playing on cellphones.

Based on the results of the interview, the researcher developed an E-LKPD teaching material based on live worksheets in the hope that it can eliminate boredom and boredom during the learning process, supported by a suitable learning model and can help in understanding the material during learning. The analysis of teaching materials is carried out to adjust teaching materials with learning media which are then arranged in accordance with the curriculum, characteristics and tendencies of students' learning styles. Grade VI teacher, Mrs. Ika Irwaniati stated that the learning media used previously was only posters pasted on the classroom walls, there were various kinds of posters such as multiplication, division, diversity of the house, dance and many more. Sometimes I make ppt media, but because of the lack of time and energy, I rarely use that media.

Based on the results of the interview, it is known that the teaching materials used during the learning process are only fixated on books, posters due to time limitations that are not supportive to make learning media. To adjust the media used which is felt to be suitable for so many mathematics lessons, so that the liveworksheet-based E-LKPD media is very suitable for the material.

Design

In the second stage, this design is carried out before developing teaching materials. In this stage, the researcher designed the general framework of the E-LKPD and analyzed the learning materials that will be contained in it. At this stage, material adjustments to E-LKPD media are very necessary, based on learning outcomes, student needs and learning materials, E-LKPD is in accordance with these criteria, so that the design for E-LKPD is needed, this is necessary so that the learning process and goals can be achieved.

At this stage, it is necessary before developing based on the results of analysis and observation, the researcher chooses the Mathematics lesson of Circle material in the material content. The development of liveworksheet-based E-LKPD is very suitable for the needs of students.

The choice of the name of the E-LKPD product based on this liveworksheet is because grade VI children often play technology with children's movie character images. From there, the researcher took the initiative to develop an E-LKPD that children like into a liveworksheet-based E-LKPD that can help children while learning.

Development

At this stage, the researcher develops a liveworksheet-based E-LKPD with a web selection that supports the development of E-LKPD. Furthermore, at this stage of development, the researcher chooses an application that is suitable to be used to design the E-LKPD, this E-LKPD has concrete images and icons with circular materials. The stages are: *First*, the stage of designing media design. *Second*, conducting media reviews through validation of experts. *Three*, revise the media in accordance with the advice of experts. (Itaunada & Rachmadiarti, 2023)



Figure 1. Initial Design of E-LKPD

At the design stage of the E-LKPD teaching materials made in A4 size using canva. The front design of the card consists of a title section named E-LKPD, then the next section consists of instructions, materials and evaluations consisting of: multiple choice of 10 questions, 5 questions of fills, 5 questions of arrows, 5 questions of sliding, 5 questions of choosing the correct answer (check), and 5 questions of listening.



Figure 2. Instructions for E-LKPD Game based on Liveworksheet

There are material guides and work instructions in the development of this E-LKPD, this is done to make it easier for students to understand when playing and the learning goals are achieved. The material work instructions are listed on the E-LKPD with a color design, in which there are pictures and decryptions. The game instructions are designed using Canva in the most attractive and clear way possible to make it easier for users.

At the validity test stage of the development of E-LKPD teaching materials, the following scores were obtained:

Table 3. Results of the validation questionnaire

No.	Validators	Presentase	Kriteria
1.	Media Members	92%	Highly Valid
2.	Material Expert	89%	Highly Valid
3.	Lingust	90%	Highly Valid
Average Score		90%	Highly Valid

The data obtained above is data taken from the validation of experts where the score of media experts shows a figure of 92%, material experts with a figure of 89% and learning experts of 90%. With an average overall score of 90% with a very valid category, and the media can be tested in the field. This shows that the liveworksheet-based E-LKPD is feasible to use. This media is further developed

through criticism and suggestions from validator lecturers which will later become a reference for the revision of media products to be developed.

Implementation

At this implementation stage, a trial stage was carried out after the E-LKPD teaching materials had been validated and revised from a team of media and material experts. This implementation stage was tested in class VI MI Al Hidayah Mangli Jember, a total of 30 students in grade VI. In this trial stage, it was carried out to find out the responses of teachers and students regarding the liveworksheet-based E-LKPD. The results of student and teacher responses can be seen in the table below:

Table 4. Results of Teacher and Student Response Questionnaire

No.	Response Questionnaire	Presentase	Criterion
1.	Teacher's Response	90%	Highly Valid
2.	Student Response	91%	Highly Valid
Average Score		90%	Highly Valid

Based on the results of the analysis above, it can be known that the score obtained from the teacher's response questionnaire shows a figure of 90% with the category of strongly agreeing and the average score of the student response questionnaire shows a figure of 91% with the category of strongly agreeing. Based on the analysis, the average score of the two is 90% with the criteria of strongly agreeing. From these results, it can be seen that the e-LKPD teaching materials based on the liveworksheet are very interesting to use when learning, especially in the Circle material, and the E-LKPD teaching materials based on the liveworksheet are very practical to be accessed anywhere because everyone who has a link can access anywhere and anytime.

Evaluation

In the final stage of the ADDIE research, the evaluation conducted by the researcher to determine the quality of the E-LKPD developed (Yazmin & Amini, 2023). Based on the results of the trial conducted in grade VI of MI Al Hidayah Mangli Jember obtained from the response questionnaire of students and teachers as a whole showed positive results for the development of E-LKPD using a Scientific Approach to Circle Materials to Increase the Learning Interest of Class VI Students at MI Al Hidayah Mangli Jember. The results show that the media has an influence on the learning process, especially in Circle material.

In this stage of evaluation, there are several suggestions obtained through teachers and students, from these inputs and suggestions to suggestions for product improvement and refinement. The positive assessment of the development of this liveworksheet-based E-LKPD can be proven through the level of student interest in the product. Based on the information obtained from grade VI students, he suggested that the size of the game instructions used should be enlarged so that it is easy to read. Media experts also suggested that the images used be adjusted again to make them more attractive to users. The size of the product is further layered to make it look clear, with the addition of laminated to make it more durable. It can be seen in the table below:

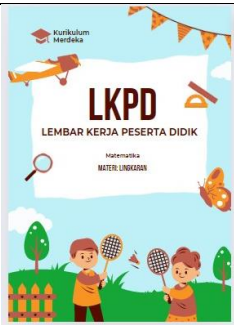

No.	Revised Point	Before Revision	After Revision
1	Use images that have Islamic nuances		

Table 5. Results of Revision of E-LKPD Teaching Materials

The image above shows changes to the image section of the E-LKPD, which is more precisely replaced by images with Islamic nuances when inserting images into the E-LKPD.



No.	Revised Point	Before Revision	After Revision
1.	Use colors that don't clash with the writing		

Table 5. Results of Revision of E-LKPD Teaching Materials

The image above shows changes in the color of the E-LKPD section, what is more interesting is that it is changed to a color that is tailored to the user. Because the research institute is more dominated by women, we use colors that

are dominantly popular with women and match the writing.

The contribution of this research provides an in-depth understanding of the development of E-LKPD using a scientific approach to circle material to increase students' interest in learning at MI Al Hidayah Mangli Jember. The findings in this research are to provide broader insight for E-LKPD developers in educational institutions. By developing E-LKPD, it is hoped that related parties can take inspiration and guidance to develop these teaching materials (Anggereni et al., 2022; Setianingrum et al., 2022). Apart from that, this research also provides an overview for future researchers to deepen their understanding of E-LKPD Development Using a Scientific Approach in Circle Material to Increase Students' Interest in Learning. Thus, the contribution of this research is very relevant in the context of E-LKPD Development Using a Scientific Approach to Circle Material to Increase Students' Interest in Learning.

CONCLUSION

Based on research conducted at MI Al Hidayah Mangli Jember, the development of Electronic Student Worksheets (E-LKPD) with a Scientific Approach to Circle Material aims to increase Class VI students' interest in learning. E-LKPD is designed with varied colors, clear Islamic themed images, and links that are easy to access via cell phone, using language that students can easily understand. The development follows the ADDIE model which includes Analysis, Design, Development, Implementation and Evaluation. The feasibility of E-LKPD has been validated by media experts and material experts with an average score of 90% which is considered valid and suitable for use in the classroom. Teacher and student response questionnaires showed strong agreement on the effectiveness and attractiveness of E-LKPD, with scores of 90% and 91% respectively.

Although feasible, E-LKPD requires internet access for the link function, and its design is tailored specifically to the needs of MI Al Hidayah Mangli Jember, which may limit its applicability in other schools. Future research should aim to develop universally applicable materials while considering students' varying needs. Additionally, it is recommended that future research explore offline accessibility options to improve usability in areas with limited internet access. This study provides valuable insight into the use of a Scientific Approach in the development of E-LKPD to increase students' interest in learning, offering guidance and inspiration for educational material developers and further research in this area.

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