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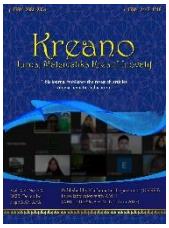

Development of E-LKPD Mathematics Using Liveworksheets with Malay Context

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Abstract

The combination of technology with local culture in this case the Malay context is a new thing in this study. One of the targets to be achieved is in the ability category, where learning independence, student mathematics, adaptive reasoning, student involvement, science literacy, assignments, mathematical connections, and teacher professionalism are presented in this study. A teacher must be the center of change in improving learning, how a teacher is able to utilize the context to design learning, where the use of context is not only as a learning ceremony but utilizes the context as a whole in an effort to build students' mathematical knowledge and also students' understanding of mathematical concepts. Education must also undergo a transformation in the Society 5.0 era. especially in mathematics learning, it is expected that learning can run in a blended learning manner. This study produces the objectives of E-LKPD mathematics using Liveworksheets with a Malay Context that is valid, practical and has a potential effect on mathematical problem solving abilities. This type of research is development research, which involves students at the junior high school level. The data for this study were obtained from the results of observations, interviews and tests. The results of this study are to produce a valid and practical Liveworksheets-based mathematics E-LKPD with a Malay context and the development of Liveworksheets-based mathematics E-LKPD with a Malay context in junior high schools that has been developed has a potential effect on students' problem-solving abilities based on the analysis that has been obtained, namely 67 students, 9 students have problem-solving abilities with a very high category, 19 students have problem-solving abilities with a high category, 18 have problem-solving abilities with a moderate category, 10 participants have problem-solving abilities with a category, 11 students have problem-solving abilities with a very low category. Then the average mathematical problem solving is 64.05, meaning that the developed E-LKPD has a moderate potential effect. This study contributes to the development of mathematics E-LKPD using liveworksheets that are more effective in overcoming students' difficulties in learning mathematics.

Keywords: E-LKPD; Malay; Liveworksheets; Problem Solving Ability.

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Abstrak

Perpaduan teknologi dengan budaya lokal dalam hal ini konteks melayu menjadi novelty dari penelitian ini. salah satu target yang akan digapai yaitu pada kategori kemampuan, dimana kemandirian belajar, matematis siswa, penalaran adaptif, keterlibatan siswa, literasi sains, penugasan, koneksi matematika serta keprofesionalan guru dimunculkan dalam penelitian ini. Seorang guru harus menjadi center perubahan dalam perbaikan pembelajaran, bagaimana seorang guru mampu memanfaatkan konteks untuk mendesain pembelajaran, dimana penggunaan konteks tidak hanya sebagai ceremony pembelajaran tetapi memanfaatkan konteks secara utuh dalam upaya membangun pengetahuan matematik siswa dan juga pemahaman konsep matematika siswa. Pendidikan juga harus mengalami transformasi di era Society 5.0. khususnya pada pembelajaran matematika diharapkan pembelajaran dapat berjalan secara blended learning. Penelitian ini bertujuan menghasilkan E-LKPD matematika menggunakan Liveworksheets dengan Konteks Melayu yang valid, praktis dan memiliki efek potensial terhadap kemampuan pemecahan masalah matematis. Jenis penelitian ini adalah penelitian pengembangan, yang melibatkan siswa di tingkat sekolah menengah pertama. Data penelitian ini diperoleh dari hasil observasi, wawancara dan tes. Hasil dari penelitian ini yaitu Menghasilkan E-LKPD matematika berbasis Liveworksheets dengan konteks Melayu yang valid dan prkatis serta Pengembangan E-LKPD matematika berbasis Liveworksheets dengan konteks Melayu di SMP yang dikembangkan memiliki efek potensial terhadap kemampuan pemecahan masalah peserta didik berdasarkan analisis yang telah diperoleh yaitu 67 peserta didik, 9 peserta didik memiliki kemampuan pemecahan masalah dengan kategori sangat tinggi, 19 peserta didik memiliki kemampuan pemecahan masalah dengan kategori tinggi, 18 peserta didik memiliki kemampuan pemecahan masalah dengan kategori sedang, 10 peserta didik memiliki kemampuan pemecahan masalah dengan kategori rendah, 11 peserta didik memiliki kemampuan pemecahan masalah dengan kategori sangat rendah. Kemudian rata-rata pemecahan masalah matematis sebesar 64,05 artinya E-LKPD yang dikembangkan memiliki efek potensial sedang. Penelitian ini memberikan kontribusi untuk pengembangan E-LKPD matematika menggunakan liveworksheets yang lebih efektif dalam mengatasi kesulitan siswa dalam belajar matematika.

INTRODUCTION

The history of problem-solving research reveals a gradual shift from rote memorization to more dynamic, application-based approaches in mathematics education (Adams & Wieman, 2015; Mariñoso et al., 2024; Szabó et al., 2020). Early educational paradigms often emphasized the memorization of formulas and algorithms, which frequently failed to translate into genuine problem-solving abilities (Alvin, 2022; Hafizi & Kamarudin, 2020; Mevarech & Kramarski, 2014; Popova et al., 2022). However, there has been growing recognition of the importance of fostering deeper understanding and analytical thinking through problem-solving (Cardellini, 2014; English, 2023; Ezeddine et al., 2023; Greiff et al., 2014; Singh et al., 2023; Syaiful et al., 2020; Szabó et al., 2020). Contemporary approaches emphasize the importance of understanding mathematical concepts, processes, and techniques to enhance students' ability to solve a wide range of mathematical problems, as well as to aid in real-life decision-making (Gyaurov et al., 2022; Hafizi & Kamarudin, 2020). This shift has led to the exploration of various pedagogical strategies aimed at enhancing students' problem-solving capabilities, including problem-based learning, collaborative projects, and the integration of technology (Barana et al., 2022; Sembiring et al., 2019; Voskoglou & Buckley, 2012). Since the 1980s, most countries have considered improving students' problem-solving ability as one of the primary goals of mathematics teaching (Frank et al., 2017; Macalalag et al., 2019; Tobón & Luna-Nemecio, 2021; Xu & Qi, 2022). This evolution has also highlighted the need for comprehensive assessment methods that go beyond traditional testing to evaluate students' problem-solving processes and strategies. Mathematical problem solving has become a very important thing to instill in students because problem-

solving is able to develop students' thinking abilities (Greiff et al., 2014; Gyaurov et al., 2022; Sadykova et al., 2025; Supardi et al., 2021). Students who possess these skills are better prepared to tackle novel challenges, demonstrating a strategic and systematic reasoning process that can be applied across different domains (Mudrika et al., 2024; Rahat et al., 2020; Rahman, 2019; Schoenfeld, 1980; Suryawati, 2021).

Efforts to bring out mathematical problem-solving abilities are the focus of improvement in mathematics learning, many students need special assistance in both understanding and using students' cognitive abilities in dealing with solving students' mathematical problems (Montague et al., 2000). Verbal mathematical problem solving is important to instill in students (Arteaga-Martínez et al., 2020), mathematical thinking that focuses on procedural knowledge, where the activities carried out are how to solve problems and apply procedures that are currently still relevant in learning situations at school (Crooks & Alibali, 2014). The use of context in presenting mathematical problems can give rise to different strategies in solving mathematical problems (Kolar & Hodnik, 2021). Students often experience difficulties in understanding concepts and solving mathematical problems due to the lack of availability of learning media that can help students and can be accessed anywhere (Haluti et al., 2022). In the Merdeka curriculum, mathematics learning emphasizes skills that are relevant to the needs of the 21st century, one of which is mathematical problem-solving skills (Jufriadi et al., 2022). Mathematical problem solving is included in high-level thinking skills (Rismawati et al., 2022). This process starts from accepting a problem to trying to solve it, so that mathematical problem solving reflects a form of deep learning. One of the obstacles in learning mathematics in junior high school is the low ability of students to solve mathematical problems, which has an impact on their low learning outcomes. This is caused by the inability of students to interpret problems into mathematical models and the inaccuracy of the problem-solving strategies used (Kristantini, 2022). This ability is very important for students to have because it places more emphasis on the process and strategies carried out by students, not just the end result (Khasanah et al., 2021). Therefore, mathematical problem solving skills need to be instilled in students from an early age.

E-LKPD is one of the mathematics learning media that can help students understand the concept of the material and solve mathematical problems with its advantage that it can be accessed from anywhere. E-LKPD is a worksheet that can be accessed using technology such as computers, smartphones, and so on, which makes it easier for teachers and students to carry out online learning.(Nianti et al., 2022). One of the educational platforms that provides E-LKPD is liveworksheets which is located at https://www.liveworksheets.com/.

Liveworksheets is an application that can change conventional worksheets into interactive ones and make them available online (Fitriani et al., 2021). Liveworksheets is an electronic media site that can be used to create interactive E-LKPD which contains images, writing and other features to produce interactive and interesting teaching materials for students (Nianti et al., 2022). Through liveworksheets, teachers can combine multimedia elements such as video, animation, images, and audio in the learning process. This E-LKPD liveworksheets teaching material innovation can be used to help teachers

and students in the learning process, such as in mathematics subjects. This website has several advantages, namely that it is easy to access at any time, free, and has a feature to automatically correct answers (Andriyani et al., 2020; Lioba et al., 2021). In addition, liveworksheets are also able to display materials in the form of images, videos, or symbols or interactive question features from multiple choice, essays, matching, and word puzzles to attract students' interest in learning online so that they can learn with pleasure and better understand the material being studied (Nirmayani, 2022). In addition, E-LKPD liveworksheets can be accessed anytime and anywhere because they are online (Asmaryadi et al., 2022).

E-LKPD will be more interesting for students if it uses a context that is close to students. One context that is close to students is the Malay context. Malay is a term used to refer to various social groups in several countries in the Southeast Asian region, including Indonesia, which show similarities in several aspects of their culture (Rohana & Grafika, 2009). The Malay context is a context that is familiar to students, especially on the island of Sumatra. The Malay context can be Malay clothing, Malay buildings, Malay musical instruments. The Malay context can be used as a context in mathematics (Lubis et al., 2023). In an effort to develop E-LKPD mathematics for students, researchers utilize the Malay context. In this case, researchers take the context of Songket Palembang, Suro Mosque Palembang, Rebana. The context used is the exploration of Malay Culture that can be associated with the material of arithmetic sequences and series, geometric transformations, prisms, pyramids, and circles. The use of context is a starting point for making students understand mathematical problems (Wedell & Malderez, 2013). The presence of context in learning helps students understand problems, explore knowledge and ultimately can make changes from previously unable to able, from previously not understanding to understanding. The use of the Malay context itself is based on the use of concrete objects in real life, so that students can explore and learn mathematics (Febrian & Astuti, 2018). The use of Malay context is also presented in an effort to motivate students in enjoyable learning (Yusra & Saragih, 2016). The problem formulations in this study are how the characteristics of E-LKPD mathematics using Liveworksheets with a valid and practical Malay Context and how the potential effects of E-LKPD mathematics using Liveworksheets with a Malay Context on mathematical problem solving abilities.

METHOD

The design research type of development study is used in this research which consists of preliminary stage and prototyping stage, which uses formative evaluation flow. The subjects of the study were junior high school students in grades VII, VIII and IX.

Preliminary Stage

The preliminary stage is the initial stage carried out in development research which contains 2 stages, namely the analysis and design stages.

Analysis Stage

The analysis stage begins with identifying potential problems and analyzing needs. At this stage, collect several references regarding geometric transformation materials, blocks and cylinders, and circles. Furthermore, the selection of research locations and subjects is carried out. Analysis of curriculum includes needs

analysis to determine learning outcomes, and learning objectives that will be implemented in E-LKPD. Then analyze the material that will be used in E-LKPD and analyze the research subjects with the aim of seeing the abilities of the subjects as one of the references in the E-LKPD that will be developed.

Design Stage

At the design stage, the researcher will design E-LKPD using liveworksheets so that it can be seen as attractive and easily understood by students. At the design stage, the researcher makes an E-LKPD flowchart and makes a storyboard. The Preliminary stage is the initial stage carried out in research that contains two stages, namely the preparation stage which begins with identifying potential problems and analyzing needs. At this stage, collect several references regarding the material of geometric transformations, blocks and cylinders, and circles. Furthermore, the selection of places and research subjects is carried out. Curriculum analysis includes a needs analysis to determine learning outcomes, and learning objectives that will be implemented in E-LKPD. Then the analysis of the material that will be used in E-LKPD and analyzing the research subjects with the aim of seeing the abilities of the subjects as one of the references in the E-LKPD that will be developed.

Prototyping Stage

Then the second stage is the design which is a step to design E-LKPD using liveworksheets that can be seen attractively and easily understood by students. The prototyping stage is the second stage of this research design. The prototyping stage uses a formative evaluation flow, consists of self-evaluation, expert reviews, one-to-one, small group, and field test (Tessmer, 1993; Zulkardi, 2006).

Self Evaluation Stage

This stage carried out by the research team together to evaluate the results of the E-LKPD that have been developed in the preliminary stage, so that the results of the E-LKPD are called prototype I which can be tested at the expert review and one-to-one stages.

Expert Review and One-to-One Stages

The Expert Review stage validates the E-LKPD that has been created to review the content, construct, and language. The experts sought are those who can make the greatest contribution to improving instruction. The validation was carried out by giving it to 8 validators, namely 6 validators from lecturers and 2 validators from mathematics subject teachers. The results of the expert review in the form of comments and suggestions from the validator are needed as revision material and to state whether the learning media created is valid or not. Expert reviews can be carried out through face-to-face interviews or in written form, and provide validation sheets containing several statements related to the E-LKPD.

Furthermore, One-to-One is carried out by a learner reviewing the instructions with the evaluator and providing comments. At this stage, the researcher conducted a test by selecting three students who have different abilities based on teacher recommendations with high, medium, and low level categories. The results of the assessment and use of media by stu-dents can review the practicality, clarity of E-LKPD and the materials that have been created. Interest in learning media is used to revise the design of the E-LKPD that has been

created. The results obtained at the expert review stage with experienced experts and from the results of one-to-one evaluation will revise prototype I, then after making improvements will produce prototype II.

Small Group Stage

This stage is used to see the practicality of the E-LKPD that was developed. At this stage, the research-er conducted a trial by selecting the number of subjects less than 20 students. The trial conducted by the researcher was on the prototype II product to a group consisting of nine students who had different abilities from low, medium, and high levels. After the researcher conducted a trial of the learning media product, students were then given a comment sheet to be able to provide com-ments/suggestions on the E-LKPD that was developed. The E-LKPD must meet the aspects of effec-tiveness, attractiveness, and applicability. Responses and suggestions are then recorded and used to improve the E-LKPD. The results of the E-LKPD improvements from the small group stage are called prototype III.

Field Test Stage

The E-LKPD with a Malay context will be tested with one class of test subjects. This study aims to see the practicality, attractiveness, applicability, acceptance and potential effects on the developed learning media. At this stage, data is collected that is used to confirm previous improve-ments and the results of the final revision in the development stage. This study aims to see aspects of the benefits of use (effectiveness), students' attitudes towards E-LKPD (Attractiveness), and ap-plicability (practicality). Furthermore, the field test is used to determine the potential effects of the developed LKPD on students' mathematical problem-solving abilities. The test is given at the field test stage after students interact with the developed LKPD. At the one-to-one stage, the subjects consisted of 3 students with different abilities. At the small group stage, there were 6 students with different abilities. At the field test stage, there were 1 class. The formative evaluation design flow can be seen in Figure 1.

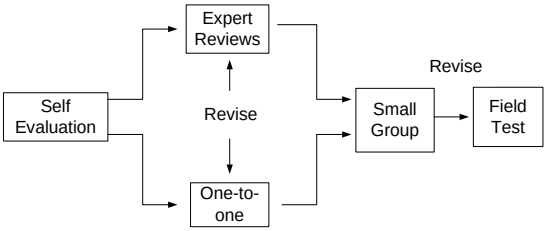

Figure 1. Formative Evaluation Design Flow

Research Instruments

The research instruments used were E-LKPD, validation sheets, observation sheets, interview sheets, and test questions.The data collection techniques used in this study were walk through, observation, interviews, and tests. Walk through was used at the expert reviews stage. Experts pro-vided comments, input, or suggestions regarding the content, construct, and language of the E-LKPD with the Malay context that was developed. The results of the walk through were used during validation with the validator. Observations and interviews were conducted with students when stu-dents were working on the E-LKPD at the one-to-one stage, then at the small group stage, and then the field test stage. This observation was carried out to find out the obstacles students faced in working on the E-LKPD at the one-to-one stage and was then used to find out the practicality of the E-LKPD at the small group stage and the field test stage. The test was used to determine the poten-tial

effects of the developed E-LKPD on students' mathematical abilities. The test was given at the field test stage after students interacted with the developed E-LKPD.

RESULT AND DISCUSSION

Results

Based on the steps of developing E-LKPD mathematics using liveworksheets with a Malay context. The E-LKPD mathematics produced from the development of mathematics is E-LKPD Mathematics with the material of geometric transformation, cubes and blocks, and circles with a Malay context consisting of songket, Suro Palembang Mosque, and rebana. There are two stages discussed in this chapter, namely the preparation stage (preliminary) and the formative evaluation stage. The formative evaluation stage consists of self-evaluation, expert reviews and one-to-one, small group, and field test.

Preliminary Stage

Analysis of Students

Analysis of students was carried out which included an analysis of the difficulties and characteristics of students in the learning process that in the geometric transformation material students had difficulty in understanding the concept and only relied on memorizing formulas without knowing how the formula was found. In addition, students are also less interested in learning mathematics because it is boring, making students less active in the learning process. The calculation of the volume of this geometric shape involves complex mathematical formulas. In addition, students also have various levels of ability (high, medium, and low) and the characteristics of students are some who are active and less active in learning. The teacher's expectations are for a learning process that makes students more active in discussing and easier to understand the concept of formulas in the geometric transformation material.

Analysis of Curriculum

The researcher analyzed the demands of the Merdeka Curriculum so that in its development it was adjusted to the demands of competency in the Merdeka Curriculum. The Merdeka Curriculum adopts an interactive learning approach where students play an active role in the learning process. In this context, the teacher functions as a facilitator who guides and supports students in developing their understanding. Interaction between students is also a major focus, allowing them to exchange ideas and experiences (Oktavia & Qudsiyah, 2023). Based on the demands of the learning curriculum, the researcher developed an E-LKPD teaching material with the hope of meeting the demands and competencies achieved in the Merdeka Curriculum. Learning Outcomes (CP) and Learning Objectives (TP) that must be achieved in the material of geometric transformations, volume of cuboids and cylinders.

Analysis of the Needs of Teaching Materials

At this stage, the researcher obtained information about the teaching materials used in schools, namely printed books from the government, student worksheets that are still printed, and the use of power points. These teaching materials have not been able to make students more active in learning. Based on this information, the researcher concluded that teaching materials were needed that could make them active in

learning. In this case, the researcher developed teaching materials that can be accessed using electronic devices, namely E-LKPD liveworksheets using the PMRI approach with a Malay context. It is hoped that this teaching material can make students more active in learning and improve students' understanding of the material on geometric transformations, cuboids and cylinders, and circles.

Prototyping Stage

Self-Evaluation Stage

The researcher evaluates the initial design that has been developed to see any obvious errors. The result of the self-evaluation stage is prototype I which will be tested in the next stage.

Expert Review Stage

This stage is to validate prototype I by identifying deficiencies in the E-LKPD. The expert review stage process with the validator in the development of the E-LKPD is explained in detail as in the Table 1.

Table 1. Expert Review

No	Comment	Revision Decision
1	It is necessary to explain how to collect the results of the E-LKPD work if it is done online, whether by email to the teacher or can it be changed according to the email of the teacher concerned.	The collection of work results has been changed to only include the name, class, and subject without having to enter the email of the teacher concerned.
2	In activity 1.1 instruction number 2, correct the sentences that can be easily understood, direct students so that they can understand that when a shape is shifted, all points will shift in the same direction and magnitude.	Correcting the question sentence to direct students to understand that when a shape is translated, all points also shift in the same direction and with the same magnitude of shift.
3	In activity 3.1 rotation shadow pattern table, the sentence should not rotate to the right or left, replace it with a more appropriate one, then check the direction of rotation again.	Sentences are corrected by rotating clockwise, and counterclockwise. Correct the direction of rotation.
4	In activity 2.1, instruction number 3, the fold lines that are not clear can be made thicker or given a different color.	Activity 2.1 instruction number 3 the fold lines are thickened and given a different color.
5	In activity 1.1 instruction number 5 give clear instructions whether to make it on paper or directly on the LKPD? Adjust. If directly on the LKPD, try making it with the drag and drop feature in liveworksheets.	In activity 1.1 instruction number 5, the command is given to move directly by utilizing the drag and drop feature.
6	Take advantage of the font size editing feature in LiveWorksheets to match the LKPD	Fix the answer font on liveworksheets that is adjusted to LKPD.
7	In activity 1.2 in figure 3, there is an illustration of the translation of a point. If it is called a point, provide a picture of a point, not a circle.	Replaces a circle-like object by ensuring that the object is a point.
8	In activities 2.1 and 4.1, video tutorials can be added to make them clearer and easier for students to understand.	Create a video tutorial for activities 2.1 and 4.1 and insert it into liveworksheets
9	In activity 3.1, how do students know that the rotation is rotated by 90 degrees? adjusted again	Adding a picture of a bow as an aid so that students know the magnitude of the rotation.

10	In activity 4.1, the illustration shows dilation. To make it clearer, try adding a picture of a flashlight.	Added auxiliary images in the form of flashlights and light so that the experimental illustrations carried out are better understood.
11	Question no. 1, which rotates the wall clock or the clock hands? Also adjust the question by adding 1 more indicator, so it's not just one question and one indicator, it can be more than one indicator of understanding mathematical concepts.	Correcting the wording of the question that the clock hands are spinning, not the wall clock. Adjusting the question by asking students to provide correct and incorrect examples so that the question has 2 indicators of conceptual understanding.
12	In the rotation section activity, it is better if the coordinate points (x,y) used are not the same as (3,3), use different x,y such as (3,4) or others, so that students are not confused when they find the shadow pattern resulting from the rotation.	Changing the coordinate point (x,y) in the rotation activity from (3,3) to point (4,3). So that students can distinguish the shadow pattern of the rotation result.
13	If the liveworksheets page is limited, pay attention to the division so that students are not confused. Don't just divide it into two, but cut it off during the work. My suggestion is to divide it into two sub-materials only. Then, the evaluation should also be on a separate link.	Divide the LKPD into 4 parts, namely the introduction, translation and reflection sub-material, rotation and dilation sub-material, and evaluation section.

One-to-One Stage

The implementation of the one-to-one stage, students carry out activities in the E-LKPD regarding geometric transformations, blocks and cylinders, and circles. Students carry out instructions according to the instructions in the E-LKPD and answer the questions. After students have finished studying the E-LKPD, they provide comments and suggestions for the E-LKPD as in the Table 2.

Table 2. Comment and Suggestion in One-to-One Stage

Name	Comment and Suggestion from Students
MSE	Very good sir, lots of interesting activities. Suggestion is to add videos to make it more interesting if possible sir.
AGS	The picture is interesting, with songket I can understand the transformation more easily.
SA	I'm glad there are musical instruments while working on it.
MDAK	It's quite helpful, but for the questions, please fix the sentences again and make the video bigger.
MJ	Interesting but the video needs to be enlarged to make it look clearer.
CMM	It's good, but the size of the letters/writing when answering in E-LKPD should be enlarged again because it's too small.
ITB	I really like the E-LKPD. I hope that in the future my math teacher can make something like this. What needs to be improved is the tambourine video section. If possible, provide an explanatory voice.
RL	Initially, I didn't like mathematics, but because of E-LKPD, Brother Fikri, I started to like mathematics a little bit. There are games and there are tambourines that I made myself.
AAS	Easy to access E-LKPD can be accessed anytime and anywhere via electronic devices such as laptops, tablets or smartphones. This makes it easier for students to learn outside the classroom

In addition to comments and suggestions through student response questionnaires, interviews were also conducted with students to confirm comfort, understanding and practicality in using E-LKPD. From the interview results, it was found that there were students who had difficulty accessing E-LKPD because the internet connection used was unstable. In addition, regarding the

appearance, it was found that students liked it because it was simple and not too crowded. One of interview excerpt can be seen in Table 3.

Table 3. Interview Excerpt

Researcher	"After seeing the E-LKPD, did you have any difficulty in accessing/opening it?"
AGS	"It took a bit of time sir, but I managed to open it sir"
Researcher	"How does it look?"
AGS	"Good sir, simple and not too crowded"
Researcher	"After seeing the E-LKPD, did you have any difficulty in accessing/opening it?"
AGS	"It took a bit of time sir, but I managed to open it sir"
Researcher	"How does it look?"
AGS	"Good sir, simple and not too crowded"

Small Group Stage

At the small group stage is the stage of testing the product in a small group consisting of 6 students to see the practicality, namely effectiveness, attractiveness and applicability. At the small group stage, assess the ease of students in using the product. The products being tested are the results of revisions from the expert review and one to one stages. At this stage to see the aspects of the benefits of use (effectiveness), student attitudes towards E-LKPD (Attractiveness), and applicability (practicality). The trial was conducted in classes VII and IX of Junior High School in Palembang, each class consisting of 6 students divided into 2 groups with different levels of ability. The following are the names of students in the small group.

At the small group stage, students use cellphones when accessing E-LKPD based on liveworksheets. The researcher explains how to use E-LKPD based on liveworksheets with the Palembang Songket Context, after which students work on each activity in the E-LKPD. At this stage, each group discusses and works together in working on the E-LKPD to answer questions.

The following Table 4 are comments and suggestions from students after studying E-LKPD which will be the researcher's evaluation in revising E-LKPD.

Table 4. Comment and Suggestion in Small Group Stage

Group	Name	Comment and Suggestion from Students
1	KA	The E-LKPD is good, I like it because the activities make me more interested in learning.
	NTNS	Learning using a cellphone is more fun and the activities make me enthusiastic about learning.
	FA	E-LKPD is cool, you can answer directly on your cellphone.
2	SCA	Interesting, because there is a picture of the songket. The suggestion is maybe you can add cartoon characters to make it more interesting.
	APC	The activity made me understand in learning the material
	GAM	I like that there are videos when working on LKPD
3	E	In this quite interactive E-LKPD contains learning videos and other interactive elements. This can make learning more interesting and enjoyable for students. My suggestion is to make the E-LKPD display more interesting so that it is not monotonous.
	HA	This E-LKPD can be accessed anytime using electronic devices such as mobile phones. This makes it easier for students to learn inside and outside the classroom.

	IR	Students can use this E-LKPD even outside the classroom because it is used via cellphone.
4	US	This E-LKPD helps me in understanding and studying the material on the volume of cuboids and cylinders where there are learning videos that provide information about the material and examples in the real world. Add more interesting elements to the E-LKPD so that it is not monotonous.
	KJH	The use of E-LKPD is quite helpful and it is hoped that teachers will implement the use of E-LKPD during learning.
	MFA	This e-LKPD is good because it can help reduce paper waste.
5	ZF	E-LKPD is made more interactive by including videos, images, animations and other interactive elements. This can make learning more interesting and enjoyable for students.
	FCA	E-LKPD is quite interesting and helps make it easier to learn circle material.
	EAS	E-LKPD really helps me so it's easier to learn the circle material, only if possible, there should be more games because they're fun.
6	AKR	The E-LKPD is good, but the way the material is delivered still needs to be improved by using language that is easy for students to understand.
	MRA	It's quite helpful, but for the questions, the sentences need to be fixed and the video should be enlarged.
	RF	This E-LKPD can be accessed at any time using a cellphone, making it easier for students to study inside and outside the classroom.

Field Test Stage

The field test stage is the last stage carried out in prototyping. This stage is carried out in full class face-to-face in August 2024. The field test was carried out in 1 class. Because there are 3 E-LKPDs, the field test involves 3 classes. At this stage, the potential effects on mathematical problem-solving abilities will be seen. The E-LKPD that was tested on students was prototype III.

Furthermore, to assess the potential effects on students' mathematical problem solving on the material of flat-sided spatial structures, especially prisms and pyramids, an evaluation of the questions was conducted on the students. In this E-LKPD media, there are 4 questions on the E-LKPD in the songket context, 5 questions on the E-LKPD in the Suro Mosque context, and 5 questions on the E-LKPD in the Rebana context. So that there are a total of 14 questions with the criteria of problem-solving ability. The stages and indicators used by the researcher were adapted from Polya (in Herlambang, 2013). These stages are understanding the problem, making a solution plan, solving the problem according to plan and rechecking. The evaluation exercises given to the students contain problem-solving indicators. This exercise is conducted to see the potential effects on problem solving in students after carrying out the learning process using E-LKPD. The discussion regarding the analysis of indicators of students' mathematical problem-solving ability is reviewed from the answers to the evaluation questions, which is shown in Figure 2 below.

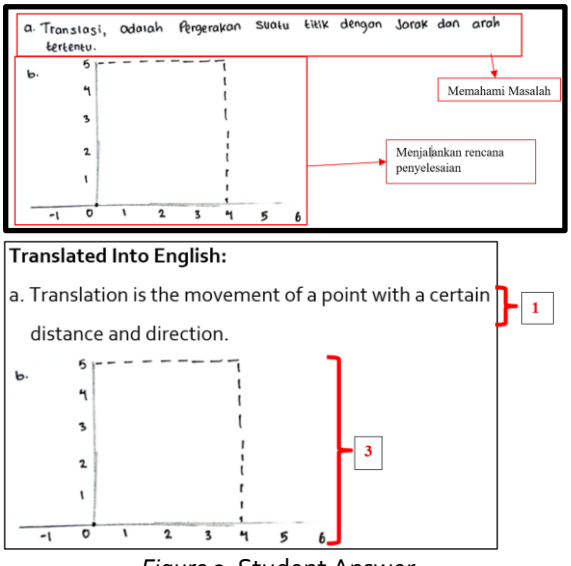

Figure 2. Student Answer

Description:
1 = Understanding problem
2 = Planning problem solving
3 = Implement the settlement plan
4 = Do a recheck

Based on the answers from student to the question, it shows that student understands the problems given in the questions and answer well and correctly. Carry out the solution plan well.

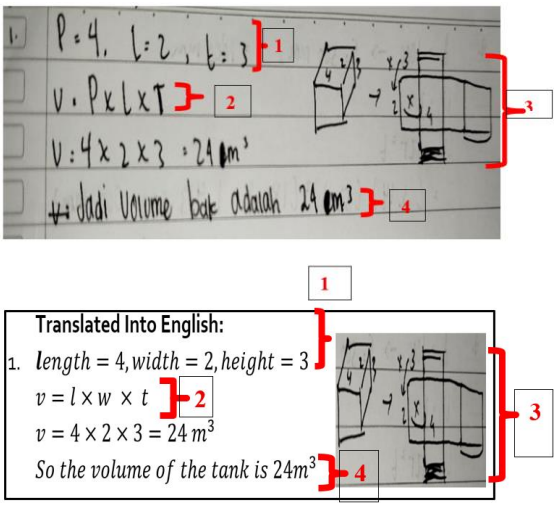

Figure 3. Student Answer

Description:
1 = Understanding problem
2 = Planning problem solving
3 = Implement the settlement plan
4 = Do a recheck

Student has shown that they have solved the problem well, namely in accordance with the indicators in mathematical problem solving. In this case, student has answered the questions well, where student is able to understand/restate what is known in the question, namely by bringing up things that are known in the question and things that are asked so that student knows the method that will be used as an effort to find the solution. In this case, student describes a cuboid-shaped tank and state the information known from question number 1, namely its length is 4 m, its width is 2 m, and its height is 3 m. Students also write down what is asked, namely the volume of the tank. Then student makes a design by describing the cuboid net to find the volume of the cuboid-shaped tank. Furthermore, students carry out the design, namely directly multiplying the length, width, and height which are the dimensions of the tank. In this case, student processes the data to obtain results. Finally, student provides conclusions from the results have obtained, namely the volume of the tank is 24 m^3.

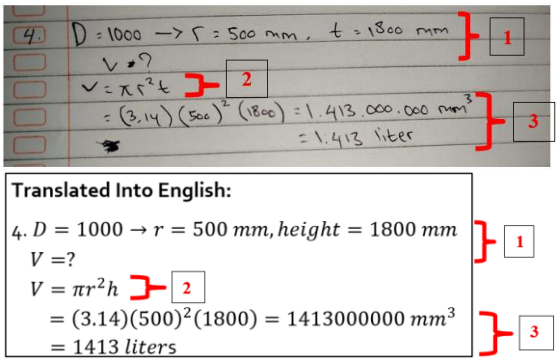

Figure 4. Student Answer

Description:
1 = Understanding problem
2 = Planning problem solving
3 = Implement the settlement plan
4 = Do a recheck

Student is good at working on questions. Student has been able to solve problems in the question according to the indicators of mathematical problem solving. Student has understood what is contained in the question, namely bringing up things that are known in the question and things that are asked so that know the method that will be used as an effort to find the results of the solution. In this case, students rewrite what is known in the question that the size of the tank is in the form of a cylinder, namely 1000 mm in diameter and 1800 mm in height. Then, student writes down what is asked from the question, namely the volume of the tedmond or the amount of water that the tedmond can hold. Then, student writes down the design that will be carried out to

answer the next stage, namely student writes the formula for the volume of the cylinder. In this case, student writes the volume of the cylinder $= \pi \times r^2 \times t$. After that, AFF carries out the solution plan according to the procedure when making the design in the previous stage, namely entering numbers or values according to the object. However, in the last step, student does not write a conclusion. In this case, student has not completed all the indicators of mathematical problem solving.

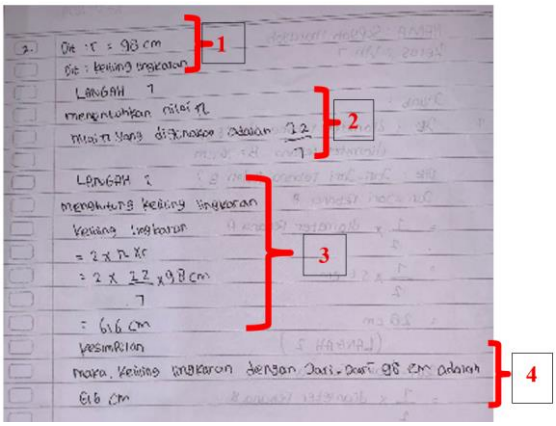

Figure 5. Student Answer

Description:
1 = Understanding problem
2 = Planning problem solving
3 = Implement the settlement plan
4 = Do a recheck

Figure 5 shows an example of student answer that meet the assessment indicators, namely understanding problem, planning Problem Solving, Implement the settlement plan, and do a recheck.

Discussion

Validity of E-LKPD Liveworksheets

The validity of the E-LKPD is proven by the validator's assessment at the expert review stage developed through the Formative stage (Hadi, 2015). The developed product meets the criteria in terms of content, construct, and language, so that it can be used and proceed to the next stage (Tessmer, 1993). At the beginning, the researcher conducted a self-evaluation stage where the product was tested first and evaluated by the researcher himself. Self-evaluation evaluates one aspect, namely visible errors, while expert review evaluates three aspects, namely content, construct, and language. In this test, the previously determined instrument is used as a guideline. The self-evaluation stage is an assessment by the research team to review the E-LKPD that has been made in order to identify visible errors. The results of the self-evaluation are the identification of errors in design and technical quality.

The next stage is expert review and one-to-one. At the expert review stage, it was carried out together with 8 validators. Validators were asked to assess the material and media on E-LKPD liveworksheets. At the expert review stage, assess the material and media. In the assessment of the media, it was assessed from the aspects of didactic requirements, technical requirements, and construction requirements. The results showed various improvements to the product such as appearance, font size, images, and so on. Furthermore, the assessment of the material was seen from the aspects of the content of the material, the up-to-dateness of the material, encouraging curiosity, the accuracy of PMRI, and the accuracy of the use of context. The result is that researchers

improve the material section such as the way of delivering the material, activities, material content that is adjusted to train the ability to understand mathematical concepts, and adjustments to evaluation questions. Improvements at this stage are carried out simultaneously with the expert review stage and the one-to-one stage. After the researchers make improvements according to the comments and suggestions that have been given.

Based on the results of the expert review, it can be concluded that the product is suitable for use according to the comments and suggestions of the validator. This is in line with Rahmawati (2021)In his research, developing E-LKPD liveworksheets on geometric transformation material was categorized as valid, so it is suitable for use.

Practicality of E-LKPD Liveworksheets

The practicality of E-LKPD liveworksheets with Malay context was assessed through experience in one-to-one, small group, and field test stages. The research was conducted offline in the classroom and using their respective mobile phones. Students carried out the learning process using E-LKPD. Data collection was carried out through a practicality comment sheet. Tessmer (1993) emphasized aspects of practicality, such as clarity, interest, effectiveness, application, and acceptance by users and organizations.

In the one-to-one stage, three students in 3 classes with various levels of ability, namely low, medium, and high, were involved in one 3x45-minute offline meeting session. Students carried out the learning process and then provided comments and suggestions. Students provided various comments and suggestions for E-LKPD. Some considered it very good with many interesting activities, and suggested adding videos. Students also enjoyed the images used, especially the songket images, which helped understand the material about transformation. There were also those who were happy with the background music when using E-LKPD.

The researcher also conducted interviews with students to confirm the answers on the practicality questionnaire sheet. Based on the interviews, students stated that they had no difficulty in accessing E-LKPD because they had a good internet connection. They also showed increased interest and were more active in learning because of the interesting activities, even though they had difficulty in doing some steps in the activities. The suggestion given was to add videos to clarify the steps. Students also said that their E-LKPD was interesting, because it used a Malay context that they had seen before and it turned out to be related to mathematics.

Based on the results of the validation sheet, comments and suggestions, and interviews with students, researchers considered various suggestions to improve the product being developed, and made improvements to produce a better product on the product that had been designed. The results of the comments and suggestions at the expert review and one-to-one stages were analyzed together and researchers improved the product from prototype I to prototype II. Furthermore, the resulting prototype II was tested at the small group stage with 6 students.

In small groups, it was tested on 3 classes with each class consisting of 6 students divided into 2 groups. 1 group consists of 3 students who have varying abilities, namely high, medium, and low. The ability of students is based on teacher recommendations seen from the results of previous student learning.

The researcher also received comments and suggestions from students. In group 1, KA found that the activities in E-LKPD provided additional motivation in learning. FA appreciated the interactive features, such as the ability to answer directly on the cellphone. In group 2, SCA was interested in the illustration of the transformation using Songket Palembang, while APC felt that the activities helped understand the material, and GAM liked the presence of videos in E-LKPD. In addition to comments and suggestions from students, the researcher also conducted interviews with students.

In the interview, it was found that although students faced obstacles in accessing E-LKPD due to slow internet connections, they gave positive responses to the appearance and activities in it. Some participants even suggested improvements by adding cartoon character images to increase the appeal. In addition, other participants felt that the activities in E-LKPD helped them understand the material more easily. Based on the results of comments, suggestions, and interviews at the small group stage, the researcher revised prototype II, then the results of the revision were called prototype III.

Next, prototype III was tested at the field test stage to students in grades VIII and IX. The field test was conducted for 3 meetings. The first and second meetings provided E-LKPD, the last meeting was to provide evaluation questions. After the learning process using E-LKPD, the researcher gave practicality sheets to students. On the practicality questionnaire sheet, aspects of acceptance of applicability and attractiveness, and aspects of teaching effectiveness were assessed.

At the field test stage, the researcher conducted interviews with several students representing their respective groups to see the validity of product development in accordance with the initial objective of developing E-LKPD, namely to solve problems that exist in students. The problems that the researcher tried to solve were students' difficulties in understanding the concept of the material, students' lack of interest in learning, and students' lack of activity in the learning process.

Based on the interview results, it was found that students were more interested because they used the liveworksheets application. This is in accordance with the statement Rahmawati (2021) in her research concluded that liveworksheets can build students' interest in learning. Furthermore, students become more active in the learning process because of the interesting activities in E-LKPD. They also said that the activities can be done with friends and discussed so that they are active in learning. This is in accordance with the statement Mubharokh et al. (2022) in their research, PMRI learning can make students more active during learning.

Students also said they could understand the concept of the material after learning because they themselves found the general concepts and formulas through the activities presented. This is in line with the research conducted (Kesumawati, 2012) in her research, the use of PMRI can improve students' conceptual understanding.

Implication of Research

This study develops E-LKPD mathematics using liveworksheets with the context of Malay in junior high schools. By knowing the development of this E-LKPD, other teachers and researchers can de-velop E-LKPD mathematics using liveworksheets in other contexts that are close to

students.

This study contributes to developing more mathematics E-LKPD using liveworksheets that are effective in overcoming students' difficulties in learning mathematics. By understanding E-LKPD, teachers and other researchers can design mathematics E-LKPD using liveworksheets that can also help students understand mathematics materials. In addition, other teachers or researchers can be inspired to use contexts that are close to students or local wisdom as contexts in developing E-LKPD or contexts in learning.

Limitation

This study is limited to the development of E-LKPD mathematics using liveworksheets with the con-text of Malay in junior high schools. Therefore, the results of this study are limited to the develop-ment of E-LKPD. Then the research is only in the context of Malay. The Malay in question is limited to the context of Malay and has not entered into the specific theory of Malay. Then the mathemat-ics material discussed is limited to only some materials available in junior high schools.

With the number of research subjects only in two schools, suggestions and input from students are limited. In addition, with research subjects only in two schools, the potential effects obtained are limited.

CONCLUSION

This study has produced a mathematics E-LKPD based on Liveworksheets with a Malay context in junior high schools. The materials taken are geometric transformations, blocks and cylinders, and circles. The Malay context used is Songket, Suro Palembang Mosque, and Rebana. The development of a mathematics E-LKPD based on a blog with a Malay context in junior high schools that has been developed has been valid. The validity in the research of E-LKPD from the instruments that have been validated by experts (validators or media experts), material experts, and context experts carried out in the expert review process in terms of content, constructs, and language. The development of a mathematics E-LKPD based on Liveworksheets with a Malay context in junior high schools that has been developed has been practical. Practicality in E-LKPD is seen from comments and suggestions and ease of students in using blogs at one-to-one and small group stages. And the development of E-LKPD mathematics based on Liveworksheets with Malay context in junior high school which was developed has a potential effect on students' problem solving abilities based on the analysis that has been obtained, namely 67 students, 9 students have problem solving abilities with very high category, 19 students have problem solving abilities with high category, 18 students have problem solving abilities with medium category, 10 students have problem solving abilities with low category, 11 students have problem solving abilities with a very low category. Then the average mathematical problem solving of 64.05 means that the developed E-LKPD has a moderate potential effect.

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