

Development of Student Worksheets Electronic (E-LKPD) for Geometry Transformation Materials

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Abstract: The purpose of this study is to develop an e-worksheet using a Live Worksheets with GeoGebra-assisted for geometric transformations, especially translation. The translation sub-topic was chosen because many students still need help finding translation concept. The type of research carried out in development research to produce e-worksheet using the ADDIE method consists of stages Analysis, Design, Development, Implementation, and Evaluation. This research was validated by material expert and design experts to get advice regarding the feasibility of e-worksheet in terms of media and material. The test subjects in this study were 15 students with high, medium, and low math ability categories. Subjects are divided into three categories to determine students' understanding of the e-worksheet so that they are able to achieve learning mastery. Students from SMPN 39 Surabaya were selected as subjects because they had never used GeoGebra-assisted e-worksheet. The data collection instruments in the study consisted of validation sheets, learning outcomes tests and student response questionnaires. The results of this study indicate that the validation results with an average score of 3.73, which means that the e-worksheet on translation is included in the very valid criteria and is feasible to use. The analysis of the use of e-worksheet shows that the average student response is 3.39, which means e-worksheet is positive and practical. Based on the test scores for learning outcomes, 14 of the 15 research subjects scored pass the Minimum Completeness Criteria, so using e-worksheet can help students learn about translation materials. Thus the translational e-worksheet using a GeoGebra-assisted Live Worksheets are valid, practical and effective.

INTRODUCTION

The face-to-face teaching and learning process began to be implemented again after online learning was carried out during the Covid-19 pandemic. However, based on the research conducted by Setiani (2020) regarding the effectiveness of the learning process during the pandemic. It was concluded that many shortcomings occurred due to the implementation of online learning, one of which was the difference in the level of network speed in each house so that students could not receive and understand the same lesson. Furthermore, the survey conducted by the Ministry of Education, Culture, Research, and Technology on junior high school students while online learning, it was found that students had difficulties understanding lessons 57.9%, lacked concentration 53.2%, could not ask directly to teachers 50.3% and were bored with online learning 45.0% (Muhammad, 2020). Therefore, studying at school can be more effective because students can receive the same material but still implement health protocols as recommended by the government.

Before Covid-19 spread in Indonesia, the implementation of applied learning was still traditional, such as the distribution of LKPD (Student Worksheets). However, suppose it was applied to a new normal situation (changes in behaviour to continue carrying out normal activities but with the addition of implementing health protocols to prevent transmission of Covid-19). In that case, it needs to be avoided because the spread of Covid-19 can be transmitted through fluids from the human body and direct contact, such as physical contact. Therefore, to avoid an increase in the Covid-19 virus by not eliminating the function of learning in schools, the researcher wants to create an electronic worksheet commonly called e-worksheet. E-Worksheet can be accessed via a smartphone or laptop for each student to avoid the risk of physical contact between students. Besides, it can prevent students from using smartphones outside of learning materials. Many students misuse their smartphones for surfing other than learning materials, and it is a challenge for teachers to take advantage of technology (Lailiah et al., 2021).

E-Worksheet is a worksheet that can provide direct feedback responses to students with the help of multimedia via smartphones or computer devices. (Putriyana et al., 2020) explained that the e-worksheet is a work guide for students to make it easier for students to learn learning material in electronic form where the application uses desktop computers, notebooks, smartphones, and cellphones. The use of e-worksheet in learning activities has an impact on student learning activities to be more enjoyable, besides that students have the opportunity to practice and be motivated in learning (Puspita et al., 2021).

E-Worksheet provides many advantages in the learning process with interactive learning activities. E-Worksheet can provide students' experience of using technology for learning, can provide opportunities for students to be involved with exploration related to the questions given, and can be used as an alternative to improve the quality of better education (Hasan Andikalan et al., 2022). Research conducted by Elsiana (2022) states that using e-worksheet during the learning process can help students understand mathematical material, such as geometry. E-Worksheet can reduce student boredom, passivity and monotonous learning. The importance of making e-worksheet in 21st-century learning is to increase student activity when learning and reduce teacher-centred learning (Suryaningsih et al., 2021).

Modern learning has made multimedia learning a mandatory tool that must be developed. However, learning during Covid-19 makes students unable to understand the material, such as offline learning, where students can easily get direct teacher guidance, especially learning mathematics which is considered difficult by most students. In addition, the lack of student motivation in learning makes it difficult for them to understand mathematical concepts that are seen as abstract (generally, teaching materials are not interactive) and avoid the process of concept discovery (Fitriani et al., 2021). Based on research done by Zanthi (2020), it can be concluded that students cannot work on math problems due to a lack of understanding of concepts.

Nursyahidah (2020) states that students have difficulty understanding the concept of transformation, including translation, reflection, rotation and combination of

transformations. In addition, students often experience difficulties related to the direction of transformation. To overcome these problems, the researchers used the Live Worksheets website, which can be used to create e-worksheet by combining features in GeoGebra. For example, geometric transformations can be applied using GeoGebra, whose features can help students explore the concept of geometric transformations. Live Worksheets can be created by uploading a document, pdf, and jpg file into worksheets containing videos, images, and music. In addition, Live Worksheets are often applied because of their interactive features such as drag and drop, multiple choice, puzzles, drop-downs, join-arrows, and short entries. It can be filled with video links, web links, GeoGebra links, and ppt. In addition, it can play songs on the worksheet.

Fitriani's research (2021), titled "Live Worksheets Realistic Mathematics Education Assisted by GeoGebra: Improving Mathematical Abstraction of Junior High School Students on Quadrilateral Material, " is a similar study, namely utilizing the Live Worksheets feature to be combined with GeoGebra. The difference from previous research lies in the material to be used, namely geometric transformations and can directly combine GeoGebra features online via a Live Worksheets link even though students still need GeoGebra accounts. The importance of learning concept discovery in geometry transformation material with visual aids inspiring researcher made e-worksheet products with the help of Live Worksheets combined with GeoGebra to attract students' attention to stay motivated in learning with a healthy learning environment.

Maulani (2020) shows that the cause of students having difficulty solving problems related to translational transformation is that students do not understand the problems and concepts of problems related to translational transformation. In addition, students also experience confusion in taking existing identities with the concept. Mutmainna (2018) said that the cause of students having difficulties in solving problems related to moving objects is that students do not understand the concept of the translation formula and are wrong in operating.

The number of misconceptions in this material proves that students do not understand the concepts being taught. The speed of students in understanding concepts also depends on the method and way of delivering the teacher when teaching in class. Appropriate methods and interesting ways of delivery make students more quickly understand the concepts being taught, and vice versa. In addition, Albab (2014) in his research stated that algebraic proof, which is general proof, is very important to improve mathematical proof abilities. For example, students have not been able to generalize that the translation of point $A(x,y)$ if it is shifted as far as (a,b) will produce an image $A'(x+a,y+b)$. One of the other difficulties experienced by students is related to the direction of transformation. Therefore the researcher tries to come up with a solution by developing Live Worksheets assisted by GeoGebra to reduce students' difficulties and direct students to recall determining the coordinates of a point and media is developed with the aim of being able to direct students to be able to understand the direction of transformation when exploring.

METHOD

This development research uses the ADDIE model. The ADDIE (Analysis, Design, Develop, Implementation, Evaluation). The ADDIE model developed by Dick and Carry can be used for various learning and product development (Mulyatiningsih in Putra, 2021). ADDIE was chosen because this model provides an opportunity to evaluate and revise continuously in every phase it goes through so that the resulting product becomes a valid and reliable product (Nurhayati et al., 2021). In addition, the ADDIE model is also very simple in its procedure, but its implementation is systematic.

Based on the description above, the procedure to be carried out follows the steps in the ADDIE model. The following is a schematic of the procedures carried out in this study.

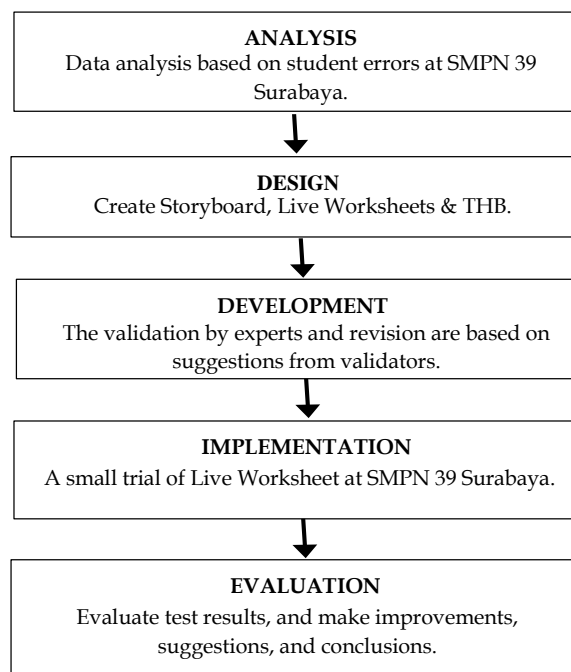


Figure 1 Research Scheme

- a) The Analysis Stage is the first stage to identify the characteristics of students to find the main problems in the mathematics learning process at junior high school (SMPN 39 Surabaya). The learning materials, media/teaching materials used, and learning outcomes must refer to the 2013 curriculum. Identifying problems through teaching materials and basic competencies is important to adapt to student characteristics in order to obtain a solution (Peterson, 2003).
- b) The Design Stage is making Storyboard which be applied Live Worksheets product for GeoGebra-assisted and Learning Outcomes Test (THB) to measure media trials.
- c) The Development is the stage of making e-worksheet. Meanwhile, to find out the feasibility of the media, improvements will be made to the media after getting validation, advice and guidance from experts. The criteria used to determine the validity of the Live Worksheets media in this study are as follows (Ploomp & Nieveen in Putra, 2021).

Table 1 Criteria of Scoring Live Worksheets

Score (N)	Validity	Practicality
$3.25 < N \leq 4.00$	Very Valid	Very Practical
$2.50 < N \leq 3.25$	Valid	Practical
$1.75 < N \leq 2.50$	Invalid	Impractical
$1.00 \leq N \leq 1.75$	Very Invalid	Very Impractical

- d) The Implementation Stage was carried out by conducting a trial of Live Worksheets assisted by GeoGebra on students at SMPN 39 Surabaya.
- e) The Evaluation Stage is the last stage by researcher to conduct an assessment the Live Worksheets media after being tested on junior high school students by giving THB (Learning Outcomes Test). The THB value will be compared with the Minimum Completeness Criteria (KKM) at junior high school (SMPN 39 Surabaya), which is 78, as a reference for the effectiveness of the media created.

RESULT AND DISCUSSION

Analysis Stage

Problem analysis at junior high school (SMPN 39 Surabaya) is the initial research stage that is important to help find the next learning solution. Researchers analyzed the problems of junior high school (SMPN 39 Surabaya) through observation, interviews, and looking for literature references. Observations were carried out directly in several classes of junior high school (SMPN 39 Surabaya) when learning mathematics on Geometry Transformation material, which then applied hybrid learning. In these observations, it was found that the use of technology in learning was still minimal in the learning carried out. After the observations were made, the researcher interviewed the teacher and learned that the teacher had difficulty making geometric transformation media. Hence, the teacher used powerpoint more as teaching material. In addition, here is the interview with several students.

Teacher : At the coordinat (2,-3), what is the value on the x-axis ?

AN : -3, Miss.

Teacher : Then, what is the value on the y-axis ?

AN : 2, Miss.

Teacher : Are you sure with your answer ?

AN : Yes, I am.

From the interview, it was found that students forgot the prerequisite material for geometric transformations, one of which was determining points on the cartesian coordinate plane.

The analysis referred to the results of direct discussions with several mathematics teachers at junior high school (SMPN 39 Surabaya). Some of the problems found teachers have difficulty applying technology to learning, especially geometry transformation material. It is in line with the data on student learning outcomes at junior high school (SMPN 39 Surabaya) in the previous academic year who had difficulty reaching the Minimum Completeness Criteria (KKM).

Based on this, students with these characteristics are accustomed to using cellphones or laptops when learning becomes less focused. If traditional learning is carried out again, researchers take the initiative to develop Live Worksheets that can be accessed at any time with interesting features so that it can minimize the use of cell phones for things outside the interests of student learning.

The material design is based on the 2013 Indonesian Curriculum: Basic Competencies 3.5 and 4.5. In this study, Live Worksheets development was carried out for meetings consisting of one translation sub-material with indicators of competency achievement in *Table 2*. Making Live Worksheets based on the rules given by the Ministry of National Education where the tools made must meet the following components: (1) title; (2) learning instruction; (3) the competencies to be achieved; (4) subject matter; (5) supporting information; work tasks and steps; and (6) assessment.

Geometry Transformation is divided into 4 sub-materials, namely: reflection; translation; rotation; and dilated. The researcher made a special Live Worksheets on the translation sub-material because the probationary period for students took little time, considering that learning in the recovery situation after Covid-19 was very limited.

Table 1 Materials on Geometry Transformation Based on the 2013 Curriculum in Indonesia

BASIC COMPETENCIES		INDICATOR
3.5	Explain geometric transformations (reflection, translation, rotation, and dilation) associated with contextual problems.	3.5.5 Explain the definition of tran
		3.5.6 Decide the shadow of the translated object.
4.5	Solve contextual problems related to geometric transformations (reflection, translation, rotation, and dilation)	.5.2 Determine the solution to the j contextual related to translation

Design Stage

Live Worksheets design combined with GeoGebra can be an alternative solution in learning geometry transformations. The following is a THB instrument that covers basic competencies 3.5 and 4.5, referring to the K-13 curriculum. The type of question describes five questions regarding the grid in *Table 3*.

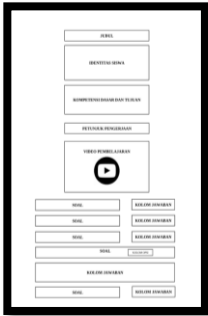
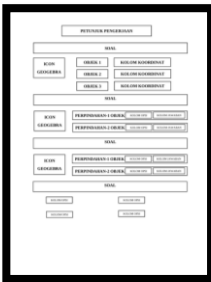
Table 2 THB Indicator

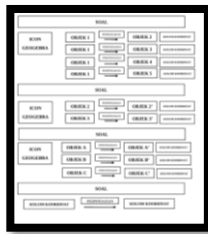
BASIC COMPETENCIES	INDICATOR	COGNITIVE LEVEL	QUESTION INDICATOR	LEVEL	
3.5 Describe geometric transformations (reflection, translation, rotation, and dilation) associated with contextual problems	3.5.5 Explain the definition of translation	C3	Given a picture of an object shifting so that it forms a shadow, students can explain what is meant by translation.	Low	
			Given an ABC triangle object and triangular shadows after reflection, translation, rotation and dilation, students can choose the right image after translating triangle ABC and explain and determine the value of the shift.	Low	
	3.5.6 Determining the shadow of translated object		Given a point/line/plane object, students can determine the image of the translated object by shifting (-1, 4).	Medium	
			Given a parallelogram whose one side is unknown, students can determine the value of the shift to find out the other coordinates of the parallelogram and the coordinates of the image.	High	
4.5 Solving contextual problems related to geometric transformations (reflection, translation	4.5.2 Determine solutions to contextual problems related to translation	C4	Given a question of transferring items from a student's classroom to another bench, students can solve it using translation.	Medium	

The storyboard for the development of Live Worksheets media with the help of GeoGebra is presented in *Table 4*.

Storyboard is made to make it easier to manage the appearance of Live Worksheets media. The storyboard is divided into three parts, the first part is created to introduce students to how to use GeoGebra. In the second part, students are led to find the concept of translation. The final part is made so that students can answer questions after finding the translation formula.

Table 4 Live Worksheets Storyboard

Storyboard Display	Description
	<p>This page is the first page that students will see before doing the worksheet. The page contains the worksheet title and student identity. There is information on Basic Competencies, objectives, and operating instructions so that students can understand the purpose of making the worksheet; besides that, there is a video to help students find information to answer the questions in the worksheet.</p> <p>The first three questions are made to direct students to understand the meaning of the transfer, and the answer column is not a multiple-choice answer to avoid students guessing the answer. Instead, the options column has two choices of answers that can make it easier for students to make conclusions.</p>
	<p>The second page on the first link gives instructions for working so that students can take advantage of the GeoGebra icon feature to explore finding answers on GeoGebra automatically.</p> <p>The questions on this page invite students to recall related to determining the coordinates of an object.</p> <p>The next question ask students to determine the magnitude and direction of the displacement of an object.</p>



In the second link, three questions direct students to complete the answers in the empty columns. First, displace several objects with a certain translational distance so students can conclude changes in position at points, lines, and planes.

This page was created with the aim that students can find the general formula of translation.



On the first page of the third link, there is a translation formula found by students in the previous link.

Some problems can be solved using the translation formulas that have been found.



The last page on the worksheet is given a reflection for students to fill in. Finally, a comment column is given regarding the worksheet that has been done.

Development Stage

At this stage, the activities of making Live Worksheets from start to finish will be carried out, and validation from media and material experts. This Live Worksheets created through the website <https://www.liveworksheets.com/> with features that make it easy to create interactive worksheets such as **Figure 2**. This section explains and provides directions for beginners on how to input formulas to create a Live Worksheets. Live Worksheets was chosen because it is very easy to create interactive worksheets without a coding process. In addition, this research can be a reference for teachers making Live Worksheets on other materials.

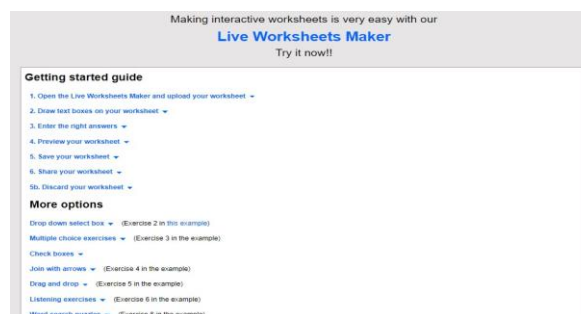


Figure 2 Steps on How To Make Live Worksheets

The Live Worksheets does not have a feature to directly design the worksheet, so a pdf file must be prepared to be uploaded first, as shown in **Figure 3**. Worksheet files are created using word, canva or other applications and then converted into pdf format. Canva **Figure 4** was chosen to design the worksheet because of its many features and a large selection of free images. Canva can help teachers make interesting presentations and teaching materials (Resmini et al., 2021).

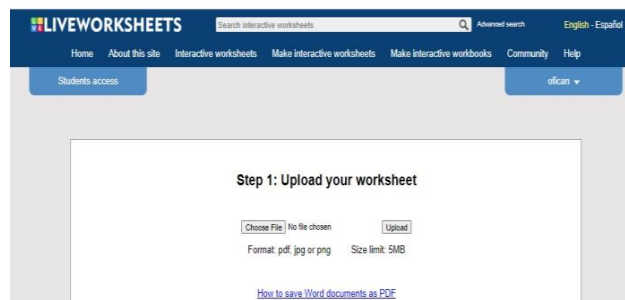


Figure 3 Page to Upload Worksheet Design

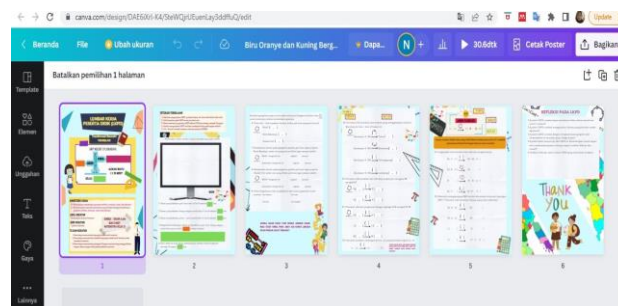


Figure 4 Worksheet Design using Canva.

The Live Worksheets combined with GeoGebra makes it easier for students to observe and find the concept of translation. Researchers use the feature to combine the GeoGebra link designed on the Live Worksheets feature, as shown in *Figure 4* and *Figure 5*. Developing a GeoGebra-assisted Live Worksheets can make it easier for students to find mathematical concepts, namely translation directly. It is in line with the research conducted by Fitriani (2021), which combines GeoGebra with Live Worksheets on rectangular material.

These Live Worksheets validators are math lecturer, math teacher, and media expert who has created Live Worksheets before. The validator states that the designed Live Worksheets are suitable for use with minor revisions. The following is one of the evaluations given for media repair *Figure 5*.

Komentar/Saran:

1. Yang dimaksud oleh pembuat pada "Petunjuk: posisi awal mobil Ketika $a = 0$ dan $b = 0$ " apa ya?
2. Apa tidak ada perintah untuk menggerakkan slider X dan Y di geogebra nya? Di liveworksheet 1
3. No. 9 di liveworksheet yang pertama [TRANSLASI KELAS 9 worksheet \(liveworksheets.com\)](https://www.liveworksheets.com/worksheets/TRANSLASI_KELAS_9_worksheet) apakah yang dimaksud mengamati positif/negative di slider X dan Y?
4. Perlukah ditambahkan informasi Ketika siswa klik koreksi jawaban, jawaban yang diblok pink belum benar?

Figure 5 Evaluation results from the validator

Before the media was tested on students, the media was improved based on suggestions and comments from experts. The media, especially GeoGebra, it is more clarified by providing information regarding how to use the slider when students are exploring. Renaming the sliders with symbols x and y with the aim that students understand that if swipe right and left then the value of x will change, as well as if you move the slider up and down then the value on the y slider changes.

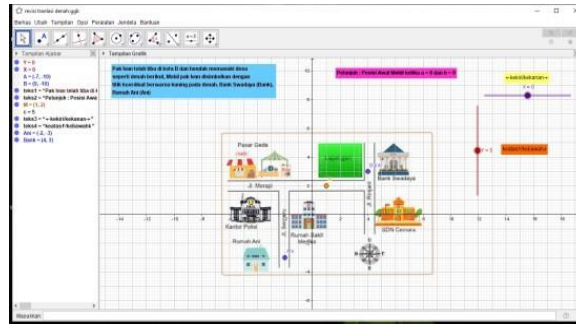


Figure 6 Floor Plan of GeoGebra

Creating a GeoGebra with a given plan and slider makes it easier for students to remember Cartesian coordinates and easily determine the coordinates of certain objects. Then to lead students to find the concept of translation, the researcher made 3 GeoGebra applets consisting of points, lines and planes.

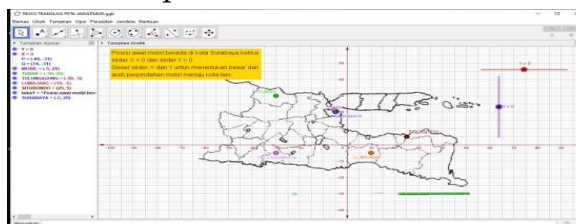


Figure 7 GeoGebra, Translation on the Point

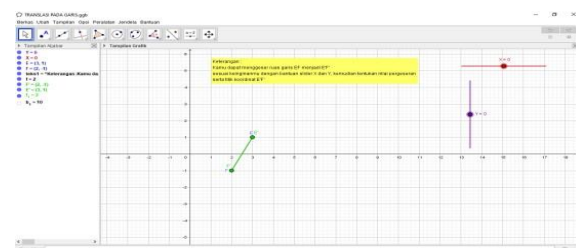


Figure 8 GeoGebra, Translation on the Line

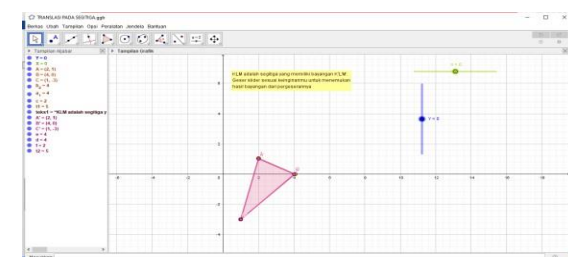


Figure 9 GeoGebra, Translation on Triangle

After designing GeoGebra to be combined with the Live Worksheets, the next step after uploading a pdf file is setting up the answer model that students will work on, setting scores and answer keys after answering the Live Worksheets.

The purpose of dividing the Live Worksheets into three parts is so that students can match the answers that have been done with the answer keys in each section. The following is a link to the Live Worksheets given to students.

- (1) <https://s.id/LiveWorksheet1> ;
- (2) <https://s.id/LiveWorksheet2> ;
- (3) <https://s.id/LiveWorksheet3>.

After the Live Worksheets was created, it was given to the validator to validate the media and the material. The validator will assess the Live Worksheets, consisting of four criteria: format, content, language, and appearance.

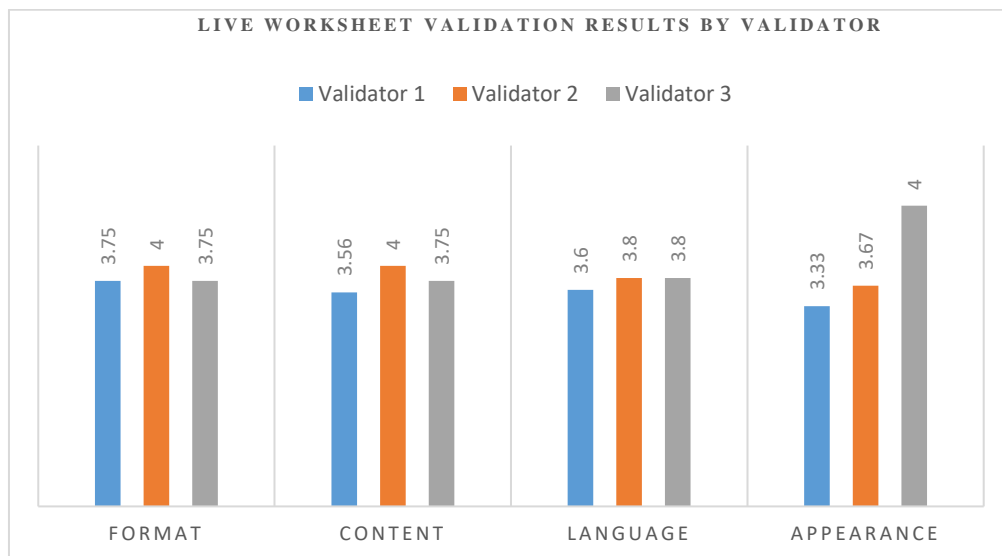


Figure 10 Live Worksheet Validation Results by Validator

Based on the validation results of three validators in Figure 10, an average validation score of 3.73 is obtained. Based on the validation criteria in Table 1, it is very valid. However, the validator also provides comments and suggestions for the media to be better. Suggestions from the validator are to improve the sentence in the indicator section. It can be measured clearly and give a command sentence to GeoGebra so that students understand when exploring using the slider. They can also fix the coordinates of Surabaya, which can move, to be replaced with a car so that the word Surabaya remains motionless. Include non-copyrighted music. Furthermore, the media can lead students through the problems of everyday life to then find mathematical concepts. Based on the feasibility results by the validator, the e-worksheet that has been made is feasible to use with a few revisions.

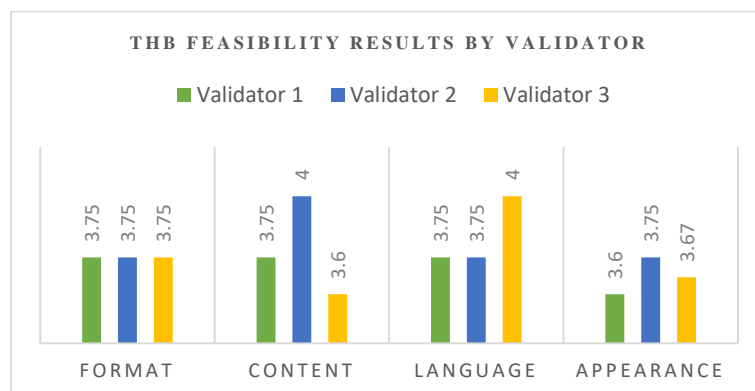


Figure 11 THB Feasibility Results by Validator

The Learning Outcome Test, which will be given after students find the concept through a Live Worksheets, is given to the validator to be tested for feasibility. Just like the Live Worksheets to assess the feasibility of THB is divided into four criteria.

Based on the results in *Figure 11*, an average validation score of 3.72 is obtained. Based on the validation criteria in *Table 1*, it is very valid, so THB can be tested on students after being given Live Worksheets.

Implementation Stage

Live Worksheets that have been declared valid by media and material experts can then be tested on 15 students with high, medium, and low mathematical abilities. During the Live Worksheets trial process, the students were very enthusiastic. In addition, they focused on their respective computing devices/ laptops/ smartphone, maybe because students used the music icon to work on the e-worksheet while listening to music.

The e-worksheet also conducts an assessment in the form of questions and answers to questions. From this, a completeness score was obtained in working on the e-worksheet as presented in *Table 6*.

Table 6. Score Live Worksheets & THB

Students	Ability Categories	Scores	THB	Completed/ Uncompleted
1	High	93	84	Completed
2	High	98	96	Completed
3	High	98	100	Completed
4	High	95	100	Completed
5	High	97	92	Completed
6	Medium	86	88	Completed
7	Medium	89	96	Completed
8	Medium	83	92	Completed
9	Medium	83	88	Completed
10	Medium	80	88	Completed
11	Low	81	68	Completed
12	Low	81	72	Uncompleted
13	Low	81	88	Completed
14	Low	83	88	Completed
15	Low	96	84	Completed

Based on the THB score, 14 out of 15 students have obtained complete results so that e-worksheet can help students learn to find the concept of translation.

The following are some Live Worksheets display that students have answered and some student responses after working on the e-worksheet.



Figure 12 GeoGebra, Translation on Triangle

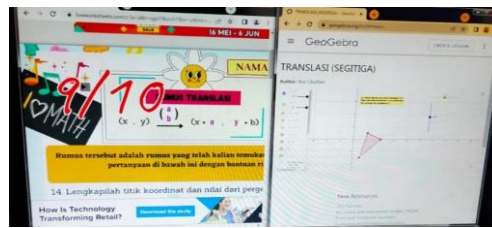


Figure 13 Students explore with GeoGebra

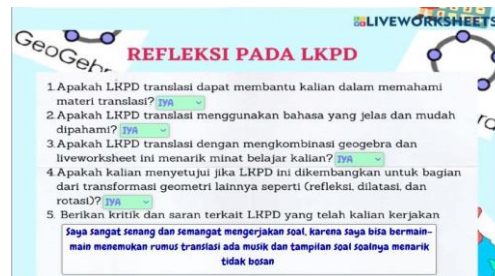


Figure 14 Student responses after working on Live Worksheets

It can be seen from the student scores and one of the student responses in Figure 12 and Figure 13 that the e-worksheet makes students not experience teacher-centred learning as usual. Students cannot discuss material outside of the material on their computer devices because of limited time, this can be seen when collecting data that students take advantage of music features and focus on their respective computer devices to find translation concepts. Students can find the concept of translation through Live Worksheets, so the teacher can explain and conclude with students when the work time is over. Besides that, the use of the slider feature and the selection of daily problems in the questions makes the Live Worksheet more interactive.

Evaluation Phases

Based on the results of the analysis in the previous stage, Live Worksheets have met the criteria for good learning media in the form of e-worksheet, namely:

- Live Worksheets categories assessed through validation sheets by media and material experts are included in the very valid category Table 1.
- There are 14 out of 15 students who get the THB score entirely, so LKPD can be used to help students learn about geometric transformations, especially translation; this is in line with Fitriani's previous research (2021) which shows the results that Live Worksheets can facilitate a more interactive way of student learning so that students can participate so that learning is more meaningful for students.
- The advantage of this media is that it can automatically combine GeoGebra features; it has many features related to designing student answer columns. Students can automatically get grades and correct answers if there are errors. Teachers can immediately get submissions of answers and student scores.
- It has difference from research that has been done before regarding the Live Worksheets which is combined with the GeoGebra feature, namely students do not experience difficulties when exploring using GeoGebra because they do not need to

have a GeoGebra account first so they can maximize their time working on the Live Worksheet. It is more interactive, easy to use and can reduce student confusion because the questions on the Live Worksheet lead students to start with everyday problems. In addition, many students are getting to know GeoGebra for the first time, so the slider feature can lead students to find answers easily.

- e) The weakness is that there are advertisements that interfere with students when working on the Live Worksheets.
- f) When a network problem occurs, student answers that have not been submitted will automatically disappear so that students will rework the

CONCLUSION

This research has developed an e-worksheet product in the form of GeoGebra-assisted Live Worksheets on translation material through the ADDIE stage. The first stage is the analysis stage which analyzes the difficulties of mathematical material that teachers and students often experience; the current curriculum is applied and chooses applications suitable for technology. Based on this information, it is necessary to develop e-worksheet in the form of Live Worksheets to find mathematical concepts, especially translation materials that can be accessed using students' smartphones or laptops. Next is the design stage by the results of the analysis stage. The first step is to design worksheet through Canva and save them in pdf format, design GeoGebra to be accessible via online links, and combine pdf and GeoGebra using the features in the Live Worksheets. At the development stage, Live Worksheets are developed using the website <https://www.liveworksheets.com/>.

Furthermore, the Live Worksheets are validated by media and material experts to make the e-worksheet usable. From the assessment of media and material experts, a score of 3.73 was obtained, with comments and suggestions for slight improvements. After the Live Worksheets were revised, the e-worksheet were tested on 15 students with high, medium, and low mathematical abilities who had not yet receive the material about geometric transformations, especially translation.

In this trial, students worked on the e-worksheet individually. If there are difficulties, students can ask the teacher. When doing the test, some students asked how to remove advertisements on the website because they could interfere with the display of questions on the Live Worksheets. These Live Worksheets still have their limitations. The first limitation is that GeoGebra cannot be explored directly on the Live Worksheets page. Instead, students must simultaneously open two pages to explore using GeoGebra and answer questions on the Live Worksheets. Meanwhile, the material developed focuses on translation only. Researchers hope for the development of e-worksheet on geometry transformation material for complete coverage all sub-topics. The second limitation is that Live Worksheets cannot load files larger than 2 MB, so file compression is necessary. Finally, the student assessment record entered in the teacher's email is only limited to thirty days; if more than that time, the teacher cannot correct the student's answer because it has been automatically deleted even though the score can be seen. Therefore, these e-worksheet need to be refined by further

researchers. Nevertheless, it can improve the shortcomings of the Live Worksheets that have been made.

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