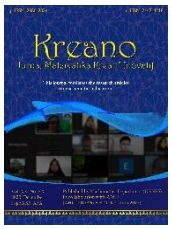
UNNES JOURNALS

Kreano, Jurnal Matematika Kreatif-Inovatif
Volume 15, number 1, 2024, pp. 83-96



The Development of Students' Worksheet Based on the Context of the Lumajang Central Park to Teach Geometric Transformation Material

Rindu Asyifa and Suwarno

UIN Kiai Haji Achmad Siddiq Jember

Correspondence should be addressed to Suwarno: s_warno@uinkhas.ac.id

Abstract

The use of Worksheet teaching materials and textbooks from the government at MTs Darul Ulum Ranupakis and learning methods that are still teacher centered. The lack of involvement in the context around students has resulted in a lack of student interest in learning mathematics, especially in class IX. One alternative to overcome this is to develop contextually based Students' Worksheet with the object of the Lumajang Central Park building. This Research aims to develop a teaching material design in the form of a Students' Worksheet on geometric transformations based on the context of the Lumajang Central Park Building that is valid, practical, and effective. This type of Research is Research and Development by following the ADDIE development model procedure with the stages of Analysis, Design, Development, Implementation, and Evaluation. This Research uses data collection techniques: observation, documentation, interviews, and questionnaires. The subjects in this Research were class IX students at MTs Darul Ulum Ranupakis. The results of the Research show that teaching materials in the form of geometric transformation worksheets based on the context of the Lumajang Regency Square building meet the criteria of valid, practical, and effective with percentages of 94.43% (very valid), 84.3% (very practical) and 80% respectively (Good). These results show that the geometric transformation of Students' Worksheet in the context of the Lumajang Central Park building is suitable for learning. This Research can be a reference and open opportunities for future researchers to integrate contextual approaches to mathematics material and develop local context-based teaching materials or explore more innovative learning methods to attract interest in learning mathematics, especially class IX students.

Keywords: contextual approach, geometric transformation, students' worksheet development.

Information of Article	
Subject classification	*97D40 Mathematics teaching methods and classroom techniques*
Article processed at	***https://journal.unnes.ac.id/nju/index.php/kreano.***
Submitted	*26 December 2023*
Review Start	*27 December 2023*
Initial Review Finish	*27 December 2023*
Round 1 Finish	*9 January 2024*
Round 2 Finish	*18 January 2024*
Accepted	*30 January 2024*
Article published at	***https://journal.unnes.ac.id/journals/kreano***
Scheduled online	*11 March 2024*
Similarity Check	*10%*

Abstrak

Penggunaan bahan ajar LKS dan buku paket dari pemerintah di MTs Darul Ulum Ranupakis dan metode pembelajaran yang masih berpusat pada guru serta kurangnya melibatkan konteks disekitar siswa membuat kurangnya minat peserta didik dalam belajar matematika, khususnya kelas IX. Salah satu alternatif untuk menanggulangi hal itu ialah mengembangkan LKPD berbasis kontekstual dengan objek bangunan alun-alun Kabupaten Lumajang. Penelitian ini bertujuan untuk mengembangkan desain bahan ajar berupa Lembar Kerja Peserta Didik (LKPD) transformasi geometri berbasis konteks bangunan alun-alun Kabupaten Lumajang yang valid, praktis dan efektif. Jenis penelitian ini yaitu Research and Development dengan mengikuti prosedur model pengembangan ADDIE dengan tahapan Analysis, Design, Development, Implementation, dan Evaluation. Teknik pengumpulan data yang digunakan dalam penelitian ini berupa observasi, dokumentasi, wawancara dan angket. Subjek dalam penelitian ini adalah siswa kelas IX MTs Darul Ulum Ranupakis. Hasil dari penelitian menunjukkan bahwa bahan ajar berupa LKPD transformasi geometri berbasis konteks bangunan alun-alun Kabupaten Lumajang memenuhi kriteria valid, praktis dan efektif dengan persentase masing-masing 94,43% (sangat valid), 84,3% (sangat praktis) dan 80% (baik). Melalui hasil tersebut dapat disimpulkan bahwa LKPD transformasi geometri dengan konteks bangunan alun-alun Kabupaten Lumajang layak untuk digunakan dalam pembelajaran. Penelitian ini dapat menjadi referensi dan membuka peluang untuk peneliti selanjutnya dalam mengintegrasikan pendekatan kontekstual pada materi matematika serta mengembangkan bahan ajar berbasis konteks lokal atau eksplorasi metode pembelajaran yang lebih inovatif untuk menarik minat belajar matematika terutama peserta didik kelas IX.

INTRODUCTION

Many students still think that mathematics is difficult because mathematics is always connected with numbers and formulas. Various ways must be considered to face and overcome various conditions of students so that they become motivated and enthusiastic about learning again. The teachers must understand their role (Lestari et al., 2023) (Harefa, 2019). Apart from being a guide and facilitator in the learning process (Surur et al., 2020), teachers must also learn to be counselors to increase students' self-confidence, significantly influencing student learning outcomes later (Gori et al., 2023). Teachers must design more exciting and fun learning about everyday life to change students' perspectives on mathematics.

Teachers can choose and use approaches that can build students' interest in mathematics, such as the contextual approach (Rahmah, 2021). The aim of this contextual approach is so that students can understand mathematical material as applied to everyday life. Learning that involves students' lives can make the learning process more meaningful and make it easier for them to understand the mathematical concepts being studied (Prahmana et al., 2021). One material that can link abstract mathematical concepts with real concepts is geometry (Maulani and Zanthy, 2020). One of the benefits of studying geometry is to provide an understanding of the beauty of the shapes around us (Susilo & Sutarto, 2023).

Geometry is one of the mathematical materials closest to our daily lives, therefore, it can be used as a stimulus for students to gain a deep understanding (Wahyuni & Alifia, 2022). Geometry is a part of mathematics that discusses points, lines, planes, and space. Geometric concepts built from these four components can be angles, flat shapes, similarity and congruence, and geometric transformations. Geometric transformation can be interpreted as a change that includes the position, size, and shape of a point, line, angle, plane, or space (Subchan et al., 2018). There are four types of geometric transformations studied in mathematics, namely translation (shift), reflection (mirror), rotation (rotation), and dilation (multiplication).

Mathematics learning can be effectively seen from the students' learning

outcomes and the teacher's ability to manage learning (Putra et al., 2020) (Yasar & Adiguzel, 2010). The choice of teaching materials in learning is one of the factors that influences students' interest in learning mathematics and their learning outcomes (Asmawati et al., 2022). The observations at the MTs Darul Ulum Ranupakis school show that in learning, especially mathematics, they still use teaching materials in the form of textbooks and Student Worksheets from the school. Based on the results of these observations, teachers need to look for other teaching material references to create variations in mathematics learning that attract more students' interest in learning. One alternative that can be done is to develop contextual-based learning designs and mathematics teaching materials in the form of teaching materials in the form of Students' Worksheet (LKS) or what are currently called Students' Worksheet (LKPD) (Novaliyosi et al., 2021).

Students' Worksheet is an assignment sheet that contains instructions for students to be able to complete assignments that have been adjusted to the KD they want to achieve (Khadijah, 2022). The content of the Students' Worksheet includes concise, structured material with practice questions or assignments that are appropriate to the material being taught (Oktarina et al., 2019). Developing a product is necessary, especially in the education sector, which is still in the low category, to improve the quality of learning(Sugiyono, 2013). Apart from that, developing teaching materials can also activate the role of students and reduce teacher-centered learning (Zurimi et al., 2023). Several researchers have tried to develop student worksheets related to mathematics material with various approaches and learning models that are culturally and contextually integrated.

A study (Ali et al., 2022) entitled "Development of Students' Worksheet Based on Poblem-Based Learning with a Contextual Approach to Improve Mathematical Problem-Solving Ability" shows the results that PBL-based Students' Worksheet with a contextual approach is very suitable for application in mathematics learning, incredibly linear program material. The Students' Worksheet is also said to improve students' mathematical problem-solving abilities effectively. Additionally, research (Fitriyah et al., 2018) entitled "Geometric Transformation Teaching Materials Based on Discovery Learning using an Ethnomathematics Approach" resulted in the development of teaching material products with very valid, very practical, and highly effective criteria. These two studies are sufficient to prove that the development of teaching materials designed with a contextual and cultural approach can be applied in mathematics learning.

This study is interested in choosing building objects or supporting elements in the Lumajang Regency Square as a contextual approach to developing teaching materials in the form of geometric transformation worksheets. As a green open space, the square functions from a social perspective, namely as a means of recreation, sports, interaction between the public, and education (Mulyanie & As'ari, 2019). Involving students in contextual learning can lead them to construct conceptual knowledge to understand a theory (Peercy & Troyan, 2017). Several components in the Lumajang Regency square contain aspects of geometric transformation, such as reflection, translation, and rotation. The concept of reflection is found at the entrance gate to the square from the east, shaped like a banana element on the right and left, with the same size and facing each other. The concept of translation (shift-

ing) is found in park benches in the square; if a bench is treated as being shifted to the right or left, the bench has transformed, namely in the form of a translation or shift. The shifted bench will have a fixed shape and size; only its position will differ from the original. The rotation concept is found in the fountain located southwest of the square. Several rectangular prism structures surround the fountain with the same size and shape and different positions, but still at the same distance from the central point.

Several geometric transformation concepts in the square are presented as in Students' Worksheet, leading to a contextual learning model. Contextual learning is a constructivist learning model where students are motivated to understand the subject matter by linking it to real-life contexts (Nurhayani, 2022). Apart from that, students can participate more actively in learning to discover the concept of geometric transformation by connecting it with the natural world (Zuleni, 2023). The expected result of this Research is that the Students' Worksheet product can help introduce geometric transformation material to class IX students with valid, practical, and effective criteria. Apart from students understanding the concept of geometric transformation material, they will also gain more knowledge through the surrounding environment. Therefore, this Research will describe the process of developing Students' Worksheet based on the context of the Lumajang Regency Square building to teach geometric transformation material to obtain Students' Worksheet results with valid, practical, and effective criteria.

METHOD

The type of Research used is Research and development (Research and Development) by following the ADDIE model development stages, namely analysis, design, development, implementation, and evaluation. Data collection techniques use various instruments, namely observation, documentation, interviews, and questionnaires. Researchers conducted observations and documentation to identify geometric transformations in the Lumajang Regency square, especially in the buildings and supporting elements. Observation also needs to be used to obtain direct information regarding the users and context of use of Students' Worksheet by conducting interviews with teachers and teachers MTs Darul Ulum Ranupakis. At the same time, a questionnaire is required to validate the Student's Worksheet product design against several validators. Apart from that, questionnaires are also essential to get responses from students and subject teachers to determine the level of practicality of the Student's Worksheet that has been created.

The procedures that need to be carried out based on the ADDIE development model are (1) Analysis, namely the initial stage to determine user needs and the context of the use of the product being developed. This stage consists of material analysis, user needs analysis, and learning environment analysis; (2) Design, namely the stage to make it easier for researchers to develop Student's Worksheet products, which consists of collecting data about material adapted to the chosen learning approach, preparing the Students' Worksheet design concept, and preparing the design of validation instruments and teacher and student response questionnaires; (3) Development, namely the realization stage of the previously designed Students' Worksheet design. The developed Students' Worksheet product was then validated with three validators: lecturers with more ex-

pertise in mathematics, Students' Worksheet design, and linguistics. This expert validation aims to measure the level of validity of the product being developed. After validation, the product is revised according to the comments and suggestions of each expert validator. The revision process is carried out until the Students' Worksheet product is declared valid by the three validators; (4) Implementation, namely the stage where the Student's Worksheet product is ready to be applied in trials. The trial phase involves teachers, learners, ass participants using small-group trials and large-group trial stages. This trial aims to measure the level of practicality of the Student's Worksheet by distributing response questionnaires to students and teachers. After going through the stage 1 revision (in the validation process), the Students' Worksheet is ready to be tested on a small group of six students of class IX who have studied and will study geometric transformation material. Learners: The response questionnaire is given to the Students' Worksheet product that has been tested. The results of filling out the questionnaire will determine whether the product is suitable for testing on a larger scale or whether there is still a need for phase II revision. If feasible, the trial will continue with 30 students at Class IX MTs Darul Ulum Ranupakis. Like the small group trial, in this trial, students were also given a questionnaire to determine the level of practicality of the Students' Worksheet product being made. The questionnaire was also given to a class IX mathematics teacher at MTs Darul Ulum Ranupakis; and (5) Evaluation, namely the process carried out to improve the product to be of higher quality. At this stage, analysis and conclusions are also carried out regarding the product's validity, practicality, and effectiveness during the development stage. Figure 1 below is a picture of the stages of the ADDIE development model (Noviyanti & Gamaputra, 2020).

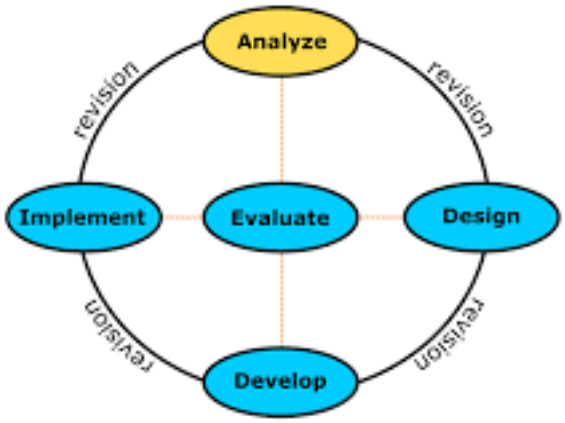


Figure 1. Stages of the ADDIE Development Model

This Research carried out three analyses, including an analysis of the validity, practicality, and effectiveness of the Students' Worksheet product. Validity analysis is obtained from the average validation percentage value of the three expert validators in material, design, and language. Practicality analysis is obtained from the average percentage of teacher and student responses in small and large group trials. Effectiveness analysis is obtained from the average learning outcome scores of students who meet the KKM (Minimum Completeness Criteria) in mathematics subjects. The following is the formula for calculating the average percentage value of validation instruments and questionnaires and the criteria for validity and practicality of Students' Worksheet, which are written in Table 1 (Destino et al., 2019).

The formula calculates the value percentage of each validation result from several experts, teacher response questionnaire, and student response questionnaire:

$$\text{Percentage} = \frac{\text{Score obtained}}{\text{Total score}} \times 100\%$$

After knowing the percentage value of each validator, the average percentage value of the three validators will determine the level of validity of the Students' Worksheet according to the validity criteria. Likewise, with the percentage value of the response questionnaire, the average percentage value of each teacher and student response questionnaire will determine the level of practicality of the Students' Worksheet according to the practicality criteria.

Table 1. Validity Criteria and Practicality

No	Score	CriteriaValidity	Criteria Practicality
1	80% - 100%	Very Valid	Very Practical
2	66% - 79%	Valid	Practical
3	56% - 65%	Fairly Valid	Quite Practical
4	40% - 55%	Less Valid	Less Practical
5	0% - 39%	Very Invalid	Very Less Practical

Mathematics learning using Students' Worksheet based on the context of the Lumajang Regency square building to introduce geometric transformation material is effective if it can achieve good learning outcomes determined by classical completeness and individual completeness. The measurement of learning outcomes here uses post-test questions given at the end of the meeting after studying the three types of geometric transformations. A student's completeness individually is determined by the madrasah minimum complateness criteria, namely 75 for mathematics lessons, while classical completeness is calculated using the following completeness percentage formula:

$$\text{Percentage} = \frac{\text{Many students have completed minimum completeness criteria}}{\text{Many students in the class}} \times 100\%$$

Once students' classical completeness scores are known, effectiveness criteria can be determined based on Table 2 (Sobiroh, 2023).

Table 2. Effectiveness Criteria

No	Score	Criteria
1	81% - 100%	Very good
2	61% - 80%	Good
3	41% - 60%	Pretty good
4	21% - 40%	Not good
5	0% - 20%	Very Not Good

RESULTS AND DISCUSSION

Results

Teaching materials in geometric transformation Students' Worksheet with the context of the Lumajang Regency square was developed following the ADDIE development model stages. The following are the stages carried out by researchers based on this development model.

Analysis

First, the analysis stage is carried out to understand material analysis, user needs analysis, and learning environment analysis. The chosen mathematics material is an introduction to geometric transformations for class IX. Based on observations and interviews with mathematics teachers for class IX students at MTs Darul Ulum Ranupakis, the identification results show that the madrasa still applies the 2013 curriculum in classes VIII and IX, while the independent curriculum is only applied in class VII. The teaching materials that mathematics teachers use in learning also still use teaching materials provided by madrasas in the form of worksheets and textbooks from the government. According to one student, the mathematics learning carried out so far is still centered on the teacher and practicing with existing teaching materials. When researchers proposed developing teaching materials in the form of Students' Worksheet with a contextual approach, the teachers strongly agreed and supported the idea. Therefore, the re-

searcher chose to develop teaching materials in Students' Worksheet based on the context of the Lumajang Regency Square building to help introduce geometric transformation material through real life. Look at Figure 2-4 below.

Figure 2. Reflection at the entrance gate to the Eastern Central Park

Figure 3. Translation of additional elements around the southwest fountain

Figure 4. Rotation of the shadows of the buildings surrounding the southwest fountain

Figures 2-4 above are concept images of the geometric transformation of the Lumajang Regency square building object. Through the results of observations made by researchers on the Lumajang Regency square object, several buildings and supporting elements can be used as mathematics learning objects, especially material for introducing geometric transformations. Integrating the context of the Lumajang Regency Central Park in mathematics learning can be used as material for creating media or teaching materials for mathematics learning based on a contextual approach. Several geometric transformation concepts found in Lumajang Regency square building objects are reflection, translation (shift), and rotation.

Design (Planning)

Second, is the design stage or conceptual design of teaching materials in the form of Student's Worksheet. This stage creates a design in the form of preparing the Students' Worksheet design and preparing the instrument design. The Students' Worksheet design is prepared using the following steps: (1) Determine the Student's Worksheet title according to the analysis results, namely the Students' Worksheet Geometry Transformation Context of the Lumajang Regency Square; (2) Determine KI and KD; (3) Reviewing the context of the Lumajang Regency square; (4) Compile geometric transformation material starting from reflection, translation, and rotation; (5) Prepare a grid of practice questions, including practice questions on geometric transformations (reflection, translation, and rotation), contextual-based practice questions on geometric transformations, and post-test questions given at the final learning meeting; (6) Develop an assessment based on the grid that has been created previously.

The Students' Worksheet design was made as attractive as possible in the context of the Lumajang Regency Central Park Building as an object for introducing geometric transformation material. The geometric transformation Students' Worksheet design with the context of the Lumajang Regency square building that has been created includes (1) Front cover;

(2) Table of contents; (3) Exposure to KI, KD, learning objectives and work steps; (4) Concept map; (5) Introduction (contains a description of the Lumajang Regency square); (6) Meeting 1 (contains reflection material as well as practice questions); (7) Meeting 2 (contains translation material as well as practice questions); (8) Meeting 3 (contains rotation material as well as practice questions). The material and questions in each meeting are presented in contextual and mathematical form. Figure 5 below shows several Students' Worksheet design components ready to be validated.

Figure 4. Students' Worksheet component design

The instrument design was prepared to determine the validity and practicality of the Students' Worksheet product being developed. Product validity is measured by the Students' Worksheet assessment instrument in the form of a validation sheet for three expert validators, namely material experts, design experts, and language experts, with indicators that have been prepared. The indicators on the material validation sheet contain aspects of the suitability of the KI KD with the learning objectives, content, and contextual learning framework. The indicators on the design validation sheet include appearance, consistency, physical criteria, and using spaces and letters. The indicators on the language validation sheet include straightforward, communicative, dialogical, and interactive aspects by language rules and student development, as well as using terms and symbols. The product's practicality is measured using the Students' Worksheet assessment instrument in the form of a questionnaire designed to determine the response of students and mathematics teachers to the product. Before being given to validators, students, and teachers, the instrument is corrected by the supervisor first; after being declared valid and appropriate, the assessment sheet is given to validators, students, and teachers to obtain data on the product's validity and practicality.

Development

Third is the development stage, which is the realization of the design stage, namely the development of Students' Worksheet and the development of research instruments. The Students' Worksheet design that has been created and is ready to be validated is submitted to three validators, each of whom is an expert lecturer in materials, design, and language. The results of each validator's validation are measured using an instrument in the

form of a questionnaire containing indicators according to their field. Table 3 below contains the validation results by material expert validators, design experts, and language experts, as well as the final average of the three validation scores.

Table 3. Expert Validation Results

No	Validator	Score	Criteria
1	Materials Expert	100%	Very Valid
2	Design Expert	97.14%	Very Valid
3	Linguist	86.15%	Very Valid
Average Validity		94.43%	Very Valid

Based on each expert's validation of the material, design, and language, the results were that all three met the very valid criteria. This means that the Students' Worksheet and the material, design, and language validation indicators have achieved a high conformity score to the desired standard. The average score of the three validation results obtained was a percentage of 94.43%, which means that the geometric transformation Students' Worksheet product in the context of the Lumajang Regency Central Park was suitable for testing on students after revisions were made based on suggestions from each expert validator.

Implementation

Fourth is the implementation stage of the Students' Worksheet product that has been developed. After the product is declared feasible by the three validators, namely material, design, and language experts, the Students' Worksheet is ready to be tested or implemented in madrasas. As one of the Tsanawiyah madrasas in Lumajang Regency, MTs Darul Ulum Ranupakis is the madrasah targeted by researchers to implement the Student's Worksheet that has been developed. This stage aims to determine the practicality and effectiveness of Students' Worksheet based on the context of the Lumajang Central Park building in teaching geometric transformation material. Product implementation is carried out in two stages: trials in small groups and trials in large groups. Small group trials were carried out on 6 class IX students from schools in Lumajang Regency who had studied and would study geometric transformation material. The six students were given a response questionnaire to determine the practicality of the Students' Worksheet product being developed before it was implemented in a larger group. After the small group trial of the Stu Students' Worksheet had met the practicality criteria, the Students' Worksheet was said to be feasible and ready to be tested on a large group of 30 class IX students at MTs Darul Ulum Ranupakis. In large group trials, response questionnaires are given after the material on the Students' Worksheet has been delivered. Apart from students in small and large group trials, response questionnaires were also given to class IX mathematics teachers with the same aim: measuring the practicality of Students' Worksheet. Table 4 below contains the results of teacher and student responses to the tested Students' Worksheet products, as well as the final average score of the response questionnaire.

Table 4. Teacher & Student Response Questionnaire Results

No	Response	Score	Criteria
1	Small Group Test	88%	Very Practical
2	Large Group Test	87%	Very Practical
3	Teacher	78%	Practical
Average Practicality		84.3%	Very Practical

Based on filling in the teacher response questionnaire to the developed Students' Worksheet product, the results showed that the Students' Worksheet meets practical criteria, which means

that the product is easy to use and can be implemented effectively by teachers. According to the results of filling out the response questionnaire from small group and large group students, the Student's Worksheet product meets the criteria of being very practical, meaning that apart from being easy to use and implement, the Student's Worksheet can be integrated into learning without any significant obstacles or difficulties. The average score from the three results of filling in the response questionnaire was obtained with a percentage of 84.3%, meeting the efficient criteria. Thus, the geometric transformation of the Students' Worksheet product in the context of the Lumajang Regency Square building does not need to be revised and can be implemented again in the broader group if necessary.

Evaluation

Fifth, the actual evaluation stage is carried out at each stage of the development model. Namely, the process carried out to improve the product's quality (Masliah et al., 2023). Based on the data analysis that has been carried out, the results obtained are that the Students' Worksheet product developed shows an average validity of 94.43% (very valid) and an average practicality of 84.3% (very practical). Thus, the geometric transformation Students' Worksheet product in the Lumajang Regency square building context is valid and practical. Students' Worksheet is also suitable for use for learning without revision. After being applied to learning geometric transformations in class IX MTs Darul Ulum Ranupakis, student learning outcomes measured learning effectiveness through post-test questions, and an average score of 80% met the good criteria. This means that the geometric transformation Students' Worksheet product in the context of the Lumajang Regency square building has achieved learning objectives by positively contributing to achieving the set competencies or learning objectives, and students can understand and respond well to the presented activities.

Discussion

This Research aims to produce a geometric transformation worksheet with the context of the Lumajang Regency square that is valid, practical, effective, and suitable for use in learning. After going through the needs analysis and design stages, the development process was carried out by realizing the Students' Worksheet design and instrument design in the form of validation questionnaires and teacher and student response questionnaires.(Fatoni & Septiadi, 2021). The Student's Worksheet product, developed according to the context of the Lumajang Regency Square building as a form of introduction to geometric transformation material, was given to three expert validators: material experts, design experts, and language experts. After the product has been revised based on comments and suggestions previously provided by each validator and declared valid, the product is ready to be tested for practicality through trials in small groups and large groups. Limited trials were carried out in small groups by distributing response questionnaires, while large group trials involved mathematics learning using the developed Students' Worksheet product and the same response questionnaire.

The Forming students' knowledge in this lesson applies Brousseau's learning theory, which links students' initial knowledge with the concepts to be studied (Brousseau, 2002). Brousseau's theo-

ry states that the formation of knowledge goes through the stages of action (looking at the Lumajang context), formulation (finding the meaning of reflection at the gate of the square, then applying it to mathematics), validation (the results of the knowledge are confirmed by the teacher or friends), institutionalization (proof of knowledge is checked through tests or quiz). Apart from that, students are allowed to discuss and summarize the material studied before bringing it to mathematical concepts and provide practice questions related to reflection, translation, and rotation problems in mathematical terms and the context of the Lumajang Regency Square building. Before starting learning, students are given information regarding the learning objectives and work steps on the Students' Worksheet. At the first meeting, students were invited to get to know and observe the context of the Lumajang Regency square first, then continued by studying the concept of reflection material through that context. Students are also asked to discuss and write conclusions about their initial knowledge about reflection through the context presented. The concept of reflection is brought to mathematical concepts so that students can conclude the material studied. Next, students were given practice questions related to reflection problems in mathematical terms and the context of the Lumajang Regency square building. At the second meeting, translation material was studied at the same stages as the previous meeting. Based on that, questionnaires were distributed to students and teachers' responses during this meeting to measure the level of practicality of the Students' Worksheet. At the third meeting, the rotation material was studied in the same stages as the previous meeting. However, at the end of the lesson, students are given post-test questions related to the reflection, translation, and rotation material that they have studied to measure their learning outcomes while using the context-based geometric transformation Students' Worksheet in the Lumajang Regency square in learning.

Based on the analysis of students' responses, the results of the post-test questions showed that around 80% out of 30 students at Class IX MTs Darul Ulum Klakah can solve questions 1-4 with entirely appropriate analysis. Meanwhile, no one has answered the correct question regarding rotation material. They seemed enthusiastic about learning geometric transformations in the context of the Lumajang Regency Square building, proven through their activity learners during discussions with their respective groups. Even though they are new to learning to use Students' Worksheet in the context of the Lumajang Regency Square building, their enthusiasm and curiosity are very high. This statement aligns with Research (Muamar & Agustyarini, 2022), which states that the contextual approach influences increasing students' interest in learning. Based on that, the contextual approach also has a very substantial effect on understanding mathematical concepts; in the case of class VII, students' understanding of the concept of building space in Research (Rahayu et al., 2023)which states that there is a substantial influence of using a contextual approach in mathematics learning Likewise, in understanding the concept of geometric transformation material carried out by researchers, a good understanding of mathematical concepts can be improved, one of which is by incorporating context into learning. (Towers et al., 2018).

Based on this, the use of geometric transformation Students' Worksheet in the context of the Lumajang Regency

square building is said to have an influence on student learning outcomes in the cognitive domain, In line with Research (Jannah & Senjayawati, 2023), which states that learning outcomes of students is said to be good due to the influence of applying a contextual approach in learning material about linear equations in one variable This is by contextual learning theory, which shows that learning in the context of the Lumajang Regency square building can involve students in learning the concept of geometric transformation through a real context independently with the contextual learning stages presented in the Students' Worksheet (Solissa et al., 2023) (Anjani & Oktaviani, 2023). After going through the development and implementation stages, the results at the evaluation stage show that the product meets the criteria of validity, practicality, and effectiveness.

Implication of Research

This Research aims to develop a geometric transformation worksheet using Lumajang Regency square building objects as a contextual approach that has positively impacted mathematics learning, especially material introducing geometric transformations. Activity learners prove this fact during the learning process using Students' Worksheet. Using geometric transformation Students' Worksheet, which uses building objects in the Lumajang Regency square, can also create good student learning outcomes. The main implication is that creating a geometric transformation worksheet that uses the Lumajang Regency square building object can help students understand the concept of geometric transformation well, especially reflection, translation, and rotation material, which is connected to objects around them, namely the Regency square building.

Limitations

Apart from having several positive implications, this Research has limitations, especially regarding mathematics learning material. Only some building objects and supporting elements in the Lumajang Regency square can be integrated into geometric transformation materials. Based on the four types of geometric transformations, the concepts researchers have identified in the buildings and supporting elements of the Lumajang Regency square are reflection, translation, and rotation. Researchers cannot include this type of dilation geometric transformation in mathematics learning using a contextual approach because the concept of dilation cannot be found in building objects and supporting elements in the Lumajang Regency square.

CONCLUSION

This development aims to produce teaching materials in the form of Students' Worksheet based on a contextual approach with the Lumajang Regency square building object that is valid, practical, and effective as an alternative to understanding concepts. Learners in mathematics learning material on geometric transformations for class IX Data from the analysis of the validity of Students' Worksheet products obtained from product validation by the three validators, material experts, design experts, and language experts, showed an overall average of 94.43% with very valid criteria Meanwhile, data from the analysis of the practicality of Students' Worksheet products were obtained from teacher responses and students about the products showed an overall average of 84.3% with very practical criteria Apart from meeting the valid and practical criteria, the geometric transformation Students' Worksheet in the context of the Luma-

jang Regency square building also influences attracting interest in learning and improving mathematics learning outcomes. These statements can be supported by the enthusiasm and activeness of students in group discussions, as well as learning outcomes in working on post-test questions given after implementing geometric transformation learning using Students' Worksheet in the context of the Lumajang Regency square building. Therefore, the effectiveness of the Students' Worksheet based on the context of the Lumajang Regency square building for teaching geometric transformation material meets the good criteria with a percentage of 80%.

REFERENCES

Ali, D., Nurhanurawati, N., & Noer, S. H. (2022). Pengembangan Lkpd Berbasis Poblem Based Learning Dengan Pendekatan Kontekstual Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(2), 829-838.

Anjani, W. A., & Oktaviani, D. N. (2023). Efforts To Improve the Ability To Understand Mathematical Concepts Of Grade Viii Junior High School Students Through The Development of LKPD Based on a Contextual Approach to Opportunity Material. In *Proceeding International Conference on Education (ICOTION)* (pp. 359-367).

Asmawati, A., Syamsinar, S., & Palimari, P. (2022). Efektivitas Pembelajaran Matematika melalui Penerapan Model Kooperatif Tipe Teams Games Tournaments (TGT). *Al-Irsyad Journal of Mathematics Education*, *1*(2), 62-70. https://doi.org/10.58917/ijme.v1i2.24

Brousseau, G. (2002). Theory of didactical situations in mathematics: Didactique des mathématiques, 1970–1990. *Kluwer Academic Publishers*, 5–8.

Destino, M. D., Bharata, H., & Caswita, C. (2019). Pengembangan Bahan Ajar Transformasi Geometri Berorientasi pada Kemampuan Bepikir Kritis Peserta Didik. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *10*(1), 57–67. https://doi.org/10.15294/kreano.v10i1.18493

Fatoni, Y. A., & Septiadi, D. D. (2021). Pengembangan LKS Berbasis Etnomatematika pada Materi Transformasi Geometri Kelas XI. *Indonesian Journal of Mathematics and Natural Science Education*, *2*(2), 115–125. https://doi.org/10.35719/mass.v2i2.67

Fitriyah, D. N., Santoso, H., & Suryadinata, N. (2018). Bahan Ajar Transformasi Geometri Berbasis Discovery Learning melalui Pendekatan Etnomatematika. *Jurnal Elemen*, *4*(2), 145-158.

Gori, Y., Fau, S., & Laia, B. (2023). Peran Guru Bimbingan dan Konseling dalam meningkatkan Kepercayaan Diri Siswa. *FAGURU: Jurnal Ilmiah Mahasiswa Keguruan*, *2*(1), 123–133.

Harefa, D. (2019). the Effect of Guide Note Taking Instructional Model Towards Physics Learning Outcomes on Harmonious Vibrations. *Journal of Student Academic Research*, *4*(1), 111–124.

Jannah, R. N., & Senjayawati, E. (2023). Penerapan Pendekatan Kontekstual Kemampuan Pemahaman Matematis Siswa SMP Kelas VII-B pada Materi Persamaan Linear Satu Variabel. *JPMI – Jurnal Pembelajaran Matematika Inovatif*, *6*(2), 851–860. https://doi.org/10.22460/jpmi.v6i2.13911

Khadijah, S. (2022). Pengembangan E-LKPD Pada Materi Lingkaran Berbasis Etnomatematika Kerajinan Anyaman Melalui Pendekatan Saintifik Untuk SMP. [Doctoral Dissertation] Universitas Lambung Mangkurat.

Lestari, N. D. S., Pambudi, D. S., Kurniati, D., Maulana, A. P., Murtafiah, W., & Suwarno, S. (2023). Kesiapan Guru Matematika Sekolah Menengah Dalam Mengajarkan Literasi Dan Numerasi Melalui Kurikulum Merdeka. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *12*(2), 1650-1660. https://doi.org/10.24127/ajpm.v12i2.6674

Masliah, S., Hendriana, H., & Purwasih, R. (2023). Pengembangan Bahan Ajar Berbantuan Geogebra pada Materi Transformasi Geometri. *Jurnal Pembelajaran Matematika Inovatif*, *6*(4), 1587–1598. https://doi.org/10.22460/jpmi.v6i4.17377

Maulani, F. I., & Zanthy, L. S. (2020). Analisis kesulitan siswa dalam menyelesaikan soal materi transformasi geometri. *Jurnal Gammath*, *5*(1), 16-25. https://doi.org/10.32528/gammath.v5i1.3189

Muamar, M. A. H., & Agustyarini, Y. (2022). Pengaruh Pendekatan Contextual Teaching And Learning Terhadap Minat Belajar Peserta Didik Mata Pelajaran Matematika. *Attadrib: Jurnal Pendidikan Guru Madrasah Ibtidaiyah*, *5*(1), 49–63. https://doi.org/10.54069/attadrib.v5i1.246

Mulyanie, E., & As'ari, R. (2019). Fungsi Edukasi Ruang Terbuka Hijau Taman Kota Tasikmalaya. *Prosiding Seminar Nasional Geografi Universitas Muhammadiyah Surakarta*, 338–345.

Novaliyosi, N., Khaerunnisa, E., & Khasanah, M. (2021). Development of LKS With a STEM Approach that Supports The Mathematical Communication Skills of SMP Students. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *12*(2), 200–211.

Noviyanti, N., & Gamaputra, G. (2020). Model Pengembangan ADDIE Dalam Penyusunan Buku Ajar Administrasi Keuangan Negara (Studi Kualitatif di Prodi D-III Administrasi Negara FISH Unesa). *Jurnal Ilmiah Manajemen Publik Dan Kebijakan Sosial*, *4*(2), 100-120. https://doi.org/10.25139/jmnegara.v4i2.2458

Nurhayani. (2022). *Teori Belajar dan Pembelajaran*. CV Gerbang Media Aksara (Anggota IKAPI).

Oktarina, A., Luthfiana, M., & Refianti, R. (2019). Pengembangan Lembar Kerja Siswa (LKS) Etnomatematika Berbasis Penemuan Terbimbing pada Materi Bangun Ruang Sisi Datar. *Jurnal Pendidikan Matematika (JUDIKA EDUCATION)*, *2*(2), 91–101. https://doi.org/10.31539/judika.v2i2.887

Peercy, M. M., & Troyan, F. J. (2017). Making transparent the challenges of developing a practice-based pedagogy of teacher education. *Teaching and Teacher Education*, *61*, 26–36. https://doi.org/10.1016/j.tate.2016.10.005

Prahmana, R. C. I., Yunianto, W., Rosa, M., & Orey, D. C. (2021). Ethnomathematics: Pranatamangsa system and the birth-death ceremonial in yogyakarta. *Journal on Mathematics Education*, *12*(1), 93–112. https://doi.org/10.22342/JME.12.1.11745.93-112

Putra, E. A., Sudiana, R., & Pamungkas, A. S. (2020). Pengembangan Smartphone Learning Management System (S-LMS) Sebagai Media Pembelajaran Matematika di SMA. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *11*(1), 36–45. https://doi.org/10.15294/kreano.v11i1.21014

Rahayu, S., Kurniasih, E., Hudori, A., Yahya, A., Sari, R. K., & Nurbaeti, U. (2023). Model Pembelajaran Kontekstual dan Pemahaman Konsep Matematika: Study Eksperimen Semu. *Edukatif: Jurnal Ilmu Pendidikan*, *5*(5), 1807–1814.

Rahmah, M. L. (2021). *Pendekatan Kontekstual dalam Pendidikan Matematika untuk Menumbuhkan Karakter Peserta Didik*. [Doctoral Dissertation] Universitas Muhammadiyah Sidoarjo.

Sobiroh, N. I. (2023). *Pengembangan Perangkat Pembelajaran Matematika Model Means-Ends Analysis (Mea) Untuk Mengajarkan Koneksi Matematis Peserta Didik Pada Materi Sistem Persamaan Linear Dua Variabel (SPLDV) di SMP Argopuro 2 Suci*. [Doctoral dissertation] UIN KH Achmad Siddiq Jember.

Solissa, E. M., Mustoip, S., & Cahyati, S. S. (2023). *Components of Contextual Teaching and Learning as The Basis for Developing a Character Education Model*. *1*, 38–46.

Subchan, Winarni, Mufid, M.S., Fahim, K., & Syaifudin., W. H. (2018). *Matematika untuk SMP/MTs Kelas IX Revisi*. Jakarta: Kementerian Pendidikan dan Kebudayaan

Sugiyono, D. (2013). *Metode Penelitian Kuantitatif, Kualitatif, dan Tindakan*. Bandung: Alfabeta.

Surur, M., Prasetya Wibawa, R., Jaya, F., Ayani Suparto, A., Harefa, D., Faidi, A., Triwahyuni, E., Kadek Suartama, I., Mufid, A., Purwanto, A., & Tinggi Agama Islam Khozinatul Ulum Blora, S. (2020). Effect Of Education Operational Cost on The Education Quality With The School Productivity As Moderating Variable. *Psychology and Education*, *57*(9), 1196–1205. https://doi.org/10.17762/pae.v57i9.445

Susilo, B. E., & Sutarto, H. (2023). Geometri: Manfaat, Pembelajaran, dan Kesulitan Belajarnya. *Bookchapter Pendidikan Universitas Negeri Semarang*, *6*, 81–106.

Towers, J., Takeuchi, M. A., & Martin, L. C. (2018). Examining contextual influences on students' emotional relationships with mathematics in the early years. *Research in Mathematics Education*, *20*(2), 146–165. https://doi.org/10.1080/14794802.2018.1477058

Wahyuni, I., & Alifia, A. L. W. N. (2022). Identifikasi Etnomatematika Pada Museum Probolinggo. *Primatika : Jurnal Pendidikan Matematika*, *11*(2), 141–148. https://doi.org/10.30872/primatika.v11i2.1136

Yasar, O., & Adiguzel, T. (2010). A working successor of learning management systems: SLOODLE. *Procedia - Social and Behavioral Sciences*, *2*(2), 5682–5685.

Zuleni, E. (2023). The Effect of Contextual Teaching and Learning and Motivation Against the Understanding of Adzkia University Students In the Course of Basic Concepts of Elementary Biology. *Edumaspul: Jurnal Pendidikan*, *7*(1), 123-130.

Zurimi, S., Wara-Wara, F., & Darwin, D. (2023). Penggunaan Modul Pembelajaran Kontekstual Matematika TerhadapHasil Belajar Siswa Pada Materi Perbandingan di Kelas VIIMTS Hasyim Asy'ari Ambon. *Jurnal Ilmiah Multidisipline*, *1*(4), 266–275.