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DEVELOPMENT OF INTERACTIVE LEARNING MEDIA BASED ON ARTICULATE STORYLINE IN THE CONTEXT OF BETAWI TRADITIONAL HOUSE TO IMPROVE MATHEMATICAL REASONING SKILLS

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Abstract

The integration of technology in education, particularly through the creation of interactive learning media, has gained significant attention as a means to enhance the quality of teaching and learning. Developing interactive learning media that incorporates the context of the Betawi Traditional House is essential, given that current educational resources, especially in mathematics, often lack real-world context. This study was conducted at a junior high school in Jakarta, focusing on seventh-grade students during the even semester of the 2023/2024 academic year. The research employed a Research and Development (R&D) approach, utilizing the Articulate Storyline platform to create interactive learning media, guided by the ADDIE development model. Data were collected through a questionnaire and essay questions, which included five items targeting mathematical reasoning skills. The questionnaire underwent validation by experts, and students provided feedback on the learning media via a separate questionnaire. Analysis of pre-test and post-test scores, using a one-sample t-test, indicated a notable improvement in post-test results compared to pre-test scores. Among the 33 participating students, the highest pre-test score was 12, achieved by just one student, while the post-test's highest score reached 18, accomplished by two students. The interactive learning media, presented as LKPD based on Articulate Storyline and contextualized within the Betawi Traditional House, is effectively designed to enhance students' mathematical reasoning skills in the study of Lines and Angles. This demonstrates that the developed learning media, validated and practical in nature, can significantly boost students' mathematical reasoning abilities.

Keywords: interactive learning media, articulate storyline, betawi traditional house

Abstrak

Pemanfaatan teknologi dalam dunia pendidikan, terutama dalam menciptakan media pembelajaran interaktif, telah menjadi fokus utama dalam usaha meningkatkan kualitas proses belajar mengajar. Pentingnya pengembangan media pembelajaran interaktif yang dikaitkan dengan Rumah Adat Betawi terlihat dari kenyataan bahwa media pembelajaran yang ada, khususnya dalam mata pelajaran matematika, belum terhubung dengan konteks nyata. Penelitian ini dilakukan di salah satu SMP di Jakarta, dengan fokus pada siswa kelas 7 pada semester genap tahun ajaran 2023/2024. Metode yang diterapkan dalam penelitian ini adalah pendekatan *Research and Development* (R&D), yang berfokus pada pengembangan media pembelajaran interaktif menggunakan platform *Articulate Storyline*, dengan mengikuti model pengembangan ADDIE. Data dikumpulkan melalui kuesioner dan soal essai yang berisi 5 pertanyaan yang menekankan pada kemampuan penalaran matematis. Kuesioner tersebut diuji oleh para ahli untuk memvalidasi instrumen, sementara siswa diminta memberikan umpan balik melalui angket mengenai media pembelajaran yang digunakan. Analisis hasil skor siswa dari pre-test dan post-test menggunakan uji t-test satu sampel menunjukkan adanya peningkatan signifikan pada skor post-test dibandingkan dengan pre-test. Dari 33 siswa yang terlibat, skor tertinggi yang diperoleh pada pre-test adalah 12, yang diraih oleh satu siswa, sedangkan pada post-test, skor tertinggi mencapai 18, yang diraih oleh dua siswa. Media pembelajaran interaktif dalam bentuk LKPD berbasis *Articulate Storyline* dengan konteks Rumah Adat Betawi dirancang untuk secara efektif meningkatkan kemampuan penalaran matematis siswa dalam mempelajari materi Garis dan Sudut. Temuan ini menunjukkan bahwa media pembelajaran yang dikembangkan, yaitu LKPD berbasis *Articulate Storyline* yang valid dan praktis, mampu meningkatkan kemampuan penalaran matematis siswa.

Kata kunci: media pembelajaran interaktif, *articulate storyline*, rumah adat betawi

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INTRODUCTION

Mathematics is one of the subjects that emphasizes reasoning. One learning mathematic's main goal is to stimulate reasoning abilities (Mutaqin, Hernawan & Mahadi, 2021). In fact, research shows a positive tendency that students with high mathematical abilities tend to have good reasoning skills (Sunarto, et al., 2021). However, this ability is still low. The latest PISA results in 2022, released in 2023, state that Indonesia's mathematics score is below the overall average, with Indonesia scoring 366. It was also stated in the report that overall, the 2022 PISA results are the lowest ever measured (OECD, 2023). Previous research indicates that the ability within student to solve mathematical problems is low if it is demanding reasoning (Afrilia & Fadina, 2020). Additionally, interviews with middle school mathematics teachers in Jakarta reveal that students' reasoning ability in solving mathematical problems tends to be low.

Betawi Traditional Houses are one of the cultural heritage rich in historical values, architecture, and complex geometry. Using this context in interactive learning media is hoped to provide a more valuable and relevant educational encounter for students, while effectively deepening their comprehension of mathematical principles.

Learning content, the educational process, and the skills to be fostered can be effectively supported by appropriate learning media. Learning media serves as a tool that facilitates the educational process, ensuring that the messages or content are conveyed clearly, thereby allowing learning objectives to be met efficiently (Nurhasanah, I., 2021). The integration of technology in education, particularly in the creation of interactive learning media, has gained significant attention as a means to enhance educational quality. Within learning media, the notion of ethnomathematics is essential, as it relates to how mathematics is contextualized within cultural or everyday experiences familiar to students (Nisa, K., Rusaman, I.M., & Ahmad, D.N., 2022). An example of this is the Betawi Kebaya House, particularly in the context of mathematics associated with measurement tasks, such as the land area of the Betawi Kebaya House, the dimensions of the house, and the size of its columns.

The creation of interactive learning media contextualized with the Betawi Traditional House is crucial, given that existing educational resources, especially in mathematics, lack connections to real-world elements that students in the Jakarta area, particularly traditional

homes, encounter. One widely used application is Articulate Storyline, which helps create engaging and interactive learning experiences. This article examines the development of interactive learning media based on Articulate Storyline, using the context of the Betawi Traditional House as a case study.

Articulate Storyline is a software tool that can be utilized for information presentation and conducting presentations (Fikriyansyah, Khair, U., & Wulan, N., 2023). This media acts as an aid for educators, employing illustrations, recordings, slides, photos, and animations to help familiarize students with PC usage. The choice of Articulate Storyline technology as a platform for developing interactive learning media stems from its versatility in delivering information in an engaging and user-friendly manner. By merging mathematical concepts with the context of Betawi Traditional Houses, the aim is to create a more impactful learning experience and deepen students' comprehension of the subject matter. The primary objective of this development is to enhance students' mathematical reasoning abilities. Therefore, the researchers are motivated to develop interactive learning media based on Articulate Storyline within the context of Betawi Traditional Houses to improve mathematical reasoning skills.

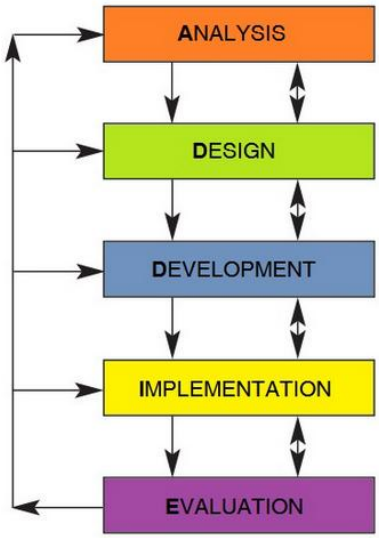
METHODS

This research was carried out at SMP TAMANSISWA, located at Jl. Percetakan Negara VIII/16, Jakarta. The participants in this study were seventh-grade students at the junior high school, and the research took place during the second semester of the 2023/2024 academic year.

The method used in this research was the Research and Development (R&D) approach by developing interactive learning media based on Articulate Storyline.

According to Organisation for Economic Co-operation and Development (OECD), Research and Development (R&D) is a creative as well as systematic activity carried out with the aim of enhancing knowledge, including knowledge based on culture, society, or the economy, as well as applying that knowledge in creating new products, processes, or services. The products produced are expected to provide large benefits to society, particularly in the field of education.

This research employs the ADDIE model as a development research methodology, which includes five stages: analysis, design, development, implementation and evaluation. The following outlines the flow of the ADDIE model research.



Picture 1. Stages of the ADDIE Development Model

Below is a description of the stages of the ADDIE development model for each phase of the research:

Table 1. Stages of the ADDIE Development Model Explanation

No.	Stage	Activity	Achievement Indicator
1	Analysis Stage	• Analysis of school conditions, specifically SMP TAMANSISWA and its learning objectives. • Pre-test of students initial mathematical reasoning abilities. • Material analysis. • Analysis of the Betawi Traditional House location, and its detailed structure.	• Identification of student's learning media needs. • Scores from the pre-test of student's reasoning abilities.

2	Design Stage	Designing interactive learning media utilizing Articulate Storyline, framed within the context of the Betawi Traditional House	The development of interactive learning media utilizing Articulate Storyline, framed within the context of the Betawi Traditional House, aims to enhance students' mathematical reasoning abilities.
3	Development Stage	• Validity testing with two experts, namely a learning media expert and a mathematics content expert. • Revisions based on feedback and suggestions from the experts. • Small-scale testing with 5-8 students.	• Results of the validation questionnaire. • Expert suggestions. • Results of the student questionnaire from the small-scale test. • Student suggestions. • Media ready for large-scale testing.
4	Implementation Stage	• Revisions based on the outcome of the small-scale testing. • Large-scale testing. • Post-test to measure the improvement in students mathematical reasoning abilities. • Practitioner testing with teachers.	• Results of the large-scale test questionnaire. • Teacher suggestions. • Media from the large-scale test results. • Post-test scores to measure the improvement in students mathematical reasoning abilities.

5	Evaluation Stage	Revisions and discussions according to the data and suggestions from experts, students, and teachers, followed by an analysis of the pre-test and post-test data.	Interactive learning media utilizing Articulate Storyline, framed within the context of the Betawi Traditional House to enhance students' mathematical reasoning abilities.

The technique for data collection in this study involved the use of questionnaires and essay-based questions, which included five items focused on indicators of mathematical reasoning skills. One set of questionnaires was directed at experts to assess validity, while another was designed for students to gather feedback on the learning media (Prasetyo & Hardjono, 2020, p. 114). Both types of questionnaires employed a Likert scale ranging from 1 to 4, defined as follows: Strongly Agreed (SA) scored 4, Agreed (A) scored 3, Disagreed (D) scored 2, and Strongly Disagreed (SD) scored 1 (Kurniawati, 2018, p. 58). The data gathered from the expert questionnaires were analyzed by calculating the total score for each validator across various aspects and determining the average score for each aspect from all validators. In contrast, the analysis of student pre-test and post-test scores was performed using the one-sample t-test.

RESULTS AND DISCUSSION

In In this study, the ADDIE development model was employed, comprising five key stages: analysis, design, development, implementation, and evaluation. Below are the outcomes of the actions undertaken by the researcher at each stage.

1. Analysis Stage

   At this stage, the researcher performed an analysis related to the conditions of the school where the research was conducted, specifically SMP TAMANSISWA, and its learning objectives. The data gathered from these aspects were collected through interviews with one seventh-grade teacher at SMP TAMANSISWA and three seventh-grade students.

After conducting the interviews, the researcher administered a pre-test consisting of 5 essay questions to 33 students to assess their initial mathematical reasoning abilities. The pre-test scores from these 33 students were as follows:

Table 2. Pre-Test Result

No.	Student Name	Pre-Test Result
1	Student 1	9
2	Student 2	9
3	Student 3	11
4	Student 4	8
5	Student 5	9
6	Student 6	8
7	Student 7	9
8	Student 8	9
9	Student 9	8
10	Student 10	10
11	Student 11	11
12	Student 12	8
13	Student 13	11
14	Student 14	8
15	Student 15	11
16	Student 16	9
17	Student 17	9
18	Student 18	6
19	Student 19	11
20	Student 20	8
21	Student 21	11
22	Student 22	11
23	Student 23	11
24	Student 24	10
25	Student 25	12
26	Student 26	10
27	Student 27	9
28	Student 28	10
29	Student 29	8
30	Student 30	9
31	Student 31	11
32	Student 32	11
33	Student 33	9

According to the pre-test results, the highest score attained by a student was 12, achieved by just one individual. Consequently, following the pre-test, the researcher examined the material and the features of the Betawi Traditional House, including its intricate structure, as a preparatory step for the next phase, which is the design stage.

2. Design Stage

During the design stage, the planning and development of interactive learning media were conducted based on the needs analysis previously completed. The researcher identified "Lines and Angles" as one of the mathematics topics that students found challenging to grasp. As a result, interactive learning media was created with the base of Articulate Storyline, contextualized within the framework of the Betawi Traditional House, linking this cultural element to the subject matter of Lines and Angles. The material included the narrative of the Betawi Traditional House, the concept of a line, the relationship between two lines, the concept of angles, types of angles, the relationship between two angles, and the transversal of two lines.

The researcher designed a storyboard or sequential sketches to guide the development of the LKPD (Student Worksheets) using Articulate Storyline. This process involved identifying specific aspects of the Betawi Traditional House that could be associated with the topic of Lines and Angles. Furthermore, 10 practice questions regarding Lines and Angles were prepared for the competency exercises included in the Articulate Storyline-based learning media.

After finalizing the storyboard or sketches, the researcher moved on to develop the interactive learning media in the form of LKPD, focusing on the seventh-grade mathematics topic of Lines and Angles within the context of Betawi Traditional Houses. This development process was divided into three stages:

1) Pre-Design

In the pre-design stage, the researcher set up the Articulate Storyline software to create the interactive learning media. Additionally, supplementary components for the media content were prepared, including navigation buttons, reading materials, practice questions, and answer sheets, which were created using the software and Canva applications. These components were then compiled and integrated into the content within the Articulate Storyline software.

2) Design

In this design stage, the researcher developed interactive learning media by integrating the material on Lines and Angles with the additional media components prepared earlier.

Picture 2. Opening and Login

In the opening and login screen, there is a field where students can enter their *Nama* and *Kelas*. This allows students to directly input their details.

Picture 3. Menu

The menu screen includes buttons for usage instructions, a preface, learning outcomes & objectives, information about (the storyline of) Betawi Traditional Houses, *Bahan Bacaan* (reading materials), *ayo berfikir* (practice questions), and *latihan kompetensi* (competency exercises), and finally, an exit button. When clicked

by the students, these buttons will take them directly to the corresponding menu they are aiming for.

Picture 4. *Bahan Bacaan* Section (Reading Materials)

In the *bahan bacaan* (reading materials) section, the content includes the definition of lines, the relationship between two lines, the definition of angles, types of angles, the relationship between two angles, and the transversal of two lines. Students can review the material on Lines and Angles, which has been concisely packaged.

Picture 5. *Latihan Kompetensi* (Competency Exercises)

In the *Latihan Kompetensi* (Competency Exercises) section, 10 questions related to the topic of Lines and Angles have been prepared, complete with images of parts of the Betawi Traditional House

Picture 6. *Lembar Jawaban* (Answer Sheet)

In the *Lembar Jawaban* (Answer Sheet) section, students can write their answers based on the work they have done. Once finished, students can click the submit button.

Picture 7. *Berhasil Menjawab* (Test Completed)

This screen continues from the previous one: once students have filled in their answers in the answer sheet and clicked the submit button, a screen like **Picture 7** will automatically appear.

3) Post-Design

In the post-design stage, the interactive learning media developed using Articulate Storyline focused on the topic of Lines and Angles for seventh-grade students undergoes a thorough check to ensure there are no errors or deficiencies.

The check includes verifying the completeness of the material, the accuracy of images and buttons, and ensuring balance across each slide and layer within the media. Once the check is complete, the media is published in HTML format on the web. The HTML format is then extracted by the researcher to ensure it can be accessed online as needed during the learning process. This process highlights the specifications in the development of interactive learning media based on Articulate Storyline, using the context of Betawi Traditional Houses to enhance mathematical reasoning skills on the topic of Lines and Angles.

3. Development Stage

During During the development phase of the learning resources in the form of LKPD (Student Worksheets) based on Articulate Storyline, contextualized with the Betawi Traditional House and focusing on the topic of Lines and Angles for seventh-grade students, validity tests were performed with two specialists: a media expert and a subject matter expert. The validity test was conducted using a questionnaire. The feedback from the experts was utilized by the researcher to enhance the interactive learning materials based on Articulate Storyline within the context of the Betawi Traditional House on the topic of Lines and Angles for seventh-grade students.

Once the validity tests with both experts were completed and a valid score for the questionnaire was received, the researcher conducted a one-sample t-test and a small-scale testing involving 5 students. After the small-scale testing, students were given a questionnaire in the form of a response survey to gather their feedback. Then, the researcher prepared the media for a larger-scale testing.

Picture 8. Small-Scale Testing

4. Implementation Stage

In the implementation stage, the researcher revised the media based according to the outcome of the small-scale testing. After the revision, the researcher conducted a large-scale testing along with a post-test to measure the improvement in students' mathematical reasoning skills. The post-test involved the same 33 students who had previously taken the pre-test. Below are the results:

Table 3. Post-Test Result

No.	Student Name	Post-Test Result
1	Student 1	14
2	Student 2	11
3	Student 3	9
4	Student 4	18
5	Student 5	10
6	Student 6	11
7	Student 7	14
8	Student 8	9
9	Student 9	13
10	Student 10	13
11	Student 11	9
12	Student 12	17
13	Student 13	7
14	Student 14	16
15	Student 15	11
16	Student 16	9
17	Student 17	12
18	Student 18	18
19	Student 19	15
20	Student 20	8
21	Student 21	11
22	Student 22	10
23	Student 23	11
24	Student 24	11
25	Student 25	11
26	Student 26	8
27	Student 27	11
28	Student 28	12

29	Student 29	17
30	Student 30	9
31	Student 31	12
32	Student 32	11
33	Student 33	9

Based on the post-test scores from the 33 students, the highest score was 18, achieved by 2 students. After the post-test, the researcher conducted a practitioner test with the seventh-grade math teacher, using a questionnaire to gather feedback. The results of this practitioner test were used by the researcher to further refine the learning media in the form of LKPD based on Articulate Storyline with the context of Betawi Traditional House for the Lines and Angles topic in 7th grade.

5. Evaluation Stage

In the final evaluation stage, the researcher made revisions to the media based on the feedback provided by experts, students, and teachers, as well as by analyzing the data from the pre-test and post-test. The results of this evaluation were utilized to refine the interactive learning materials based on Articulate Storyline that had been developed. Below is a summary of the evaluations and modifications carried out by the researcher at each stage, which contributed to the creation of the interactive learning resources in the form of LKPD based on Articulate Storyline, contextualized with the Betawi Traditional House, aimed at enhancing mathematical reasoning skills in the topic of Lines and Angles.

1) Media Expert

The evaluation of the interactive learning media created with the base of Articulate Storyline by this expert considered various key aspects. This included evaluating graphic design, interactivity, content quality, technical performance, ease of use, and the product's sustainability to ensure an optimal learning experience that aligns with the set educational goals. The qualitative feedback from the media expert included: making the storyline more prominent and engaging, not all LKPDs should start with theory, avoiding ellipsis at the end of essay questions, overall media quality is good, but the content in the LKPD should not be too cramped, we would need to leave space or margins, and increase the font size.

2) Material Expert

The material expert's evaluation of the interactive learning media created with the base of Articulate Storyline considered important aspects such as graphic design, interactivity, content quality, technical performance, ease of use, and the sustainability of the product to ensure the educational objectives were met effectively. The qualitative feedback from the material expert included: further developing the LKPD to improve students' reasoning skills, specifying the material more clearly, adding exploratory student tasks, and correcting some wordings.

3) Teacher

The evaluation of the interactive learning media created with the base of Articulate Storyline by the seventh-grade math teacher considered various important aspects. The teacher's evaluation was done using a questionnaire to gather the teacher's feedback on the learning media. The following are the teacher's responses related to the learning media created with the base of Articulate Storyline:

Table 4. Teacher Response Questionnaire Data

No.	Name	Answer															Score	Value
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1	Y	4	4	3	3	4	3	3	4	3	3	3	3	3	3	3	49	81.67
2	K	4	3	3	3	4	4	3	4	4	3	3	3	4	4	3	52	86.67
Mean																	50.5	84.17
Minimum																	49	81.67
Maximum																	52	86.67
Deviation Standard																	2.12	3.54
Variance																	4.5	12.5

4) Student

The evaluation of the interactive learning media based on Articulate Storyline by students was conducted by considering various aspects. This student evaluation utilized a questionnaire designed to collect student feedback on the learning media. The following presents the responses from the students regarding the learning media created with the base of Articulate Storyline:

Table 5. Student Response Questionnaire Data

No.	Name	Answer															Score	Value
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1	HF	4	4	3	3	3	3	3	3	4	2	3	3	3	4	3	45	78.95
2	MR	4	3	3	4	3	4	4	4	4	3	3	4	4	4	3	51	89.47

3	GP	3	4	3	3	1	3	3	3	4	4	4	4	3	4	4	46	80.70
4	NHTY	3	3	3	3	2	3	3	3	3	4	4	3	3	3	3	43	75.44
5	KN	3	3	3	3	3	3	3	3	4	4	3	4	3	3	3	45	78.95
Mean																	**46**	**80.70**
Minimum																	**43**	**75.44**
Maximum																	**51**	**89.47**
Deviation Standard																	**3**	**5.26**
Variance																	**9**	**27.70**

5) Pre-Test and Post-Test Results

After conducting Pre-Test and Post-Test on 33 students, the calculation results are below:

Table 6. Calculation Result from Pre-Test and Post-Test Scores

No.	Student Name	Score		Gain |d|	Xd (d-Md)	$(Xd)^2$
		Pre-test (X)	Post-test (Y)	|Y-X|		
1	Student 1	9	14	5	2.06061	4.246097
2	Student 2	9	11	2	-0.93939	0.882461
3	Student 3	11	9	2	-0.93939	0.882461
4	Student 4	8	18	10	7.06061	49.85216
5	Student 5	9	10	1	-1.93939	3.761249
6	Student 6	8	11	3	0.06061	0.003673
7	Student 7	9	14	5	2.06061	4.246097
8	Student 8	9	9	0	-2.93939	8.640037
9	Student 9	8	13	5	2.06061	4.246097
10	Student 10	10	13	3	0.06061	0.003673
11	Student 11	11	9	2	-0.93939	0.882461
12	Student 12	8	17	9	6.06061	36.73095
13	Student 13	11	7	4	1.06061	1.124885
14	Student 14	8	16	8	5.06061	25.60973
15	Student 15	11	11	0	-2.93939	8.640037
16	Student 16	9	9	0	-2.93939	8.640037
17	Student 17	9	12	3	0.06061	0.003673
18	Student 18	6	18	12	9.06061	82.09458
19	Student 19	11	15	4	1.06061	1.124885
20	Student 20	8	8	0	-2.93939	8.640037
21	Student 21	11	11	0	-2.93939	8.640037
22	Student 22	11	10	1	-1.93939	3.761249
23	Student 23	11	11	0	-2.93939	8.640037
24	Student 24	10	11	1	-1.93939	3.761249
25	Student 25	12	11	1	-1.93939	3.761249
26	Student 26	10	8	2	-0.93939	0.882461
27	Student 27	9	11	2	-0.93939	0.882461
28	Student 28	10	12	2	-0.93939	0.882461

29	Student 29	8	17	9	6.06061	36.73095
30	Student 30	9	9	0	-2.93939	8.640037
31	Student 31	11	12	1	-1.93939	3.761249
32	Student 32	11	11	0	-2.93939	8.640037
33	Student 33	9	9	0	-2.93939	8.640037
	Total			97		347.8788

From the table, it was found that T_{value} = 5.121248 and T_{table} = 2.03452 since $T_{value} > T_{table}$ can be concluded that there is a change.

The findings of this study align with earlier research conducted by Arum Donna Safira, Iva Sarifah, and Tunjungsari Sekaringtyas titled *"Pengembangan Media Pembelajaran Interaktif Web Articulate Storyline Pada Pembelajaran IPA Kelas V Sekolah Dasar"*, which served as a reference in the development of this research. The validation outcomes from the media expert revealed a score percentage of 94.11%, suggesting that the interactive learning media is suitable for implementation. In addition, the subject matter expert awarded a score percentage of 95.3%, indicating the relevance of the presented material. The instructional media design expert gave a score percentage of 95.8%, reflecting success in the arrangement of layout, positioning of menus and buttons, as well as the appropriate font size, color, and style. These results lead to the conclusion that the interactive learning media developed with Articulate Storyline is appropriate for use (Nugraheni, 2018). It is anticipated that utilizing this interactive learning media will enhance students' motivation to learn through engaging visual presentations of the material.

CONCLUSION

In conclusion, LKPD created with the base of Articulate Storyline with the context of Betawi Traditional House aims to improve valid and practical mathematical reasoning skills for students. Additionally, this interactive learning media created with the base of Articulate Storyline with the context of Betawi Traditional House can enhance students' mathematical reasoning skills in learning mathematics, particularly on the topic of Lines and Angles.

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