Development of Flipbooks-Based E-Book Media Based to Improve Learning Outcomes for IV Mathematics Subjects on Plane Structures in Elementary Schools

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Abstract:
Instructional media are tools used by teachers or educators to facilitate the learning process. Visual media is often used. Therefore, researchers develop e-book media based on flipbooks in the learning process. The research objectives are: (1) to analyse the development of flipbook-based e-book media, (2) to assess the eligibility of flipbook-based e-book media in improving student outcomes, and (3) to evaluate the effectiveness of this media in enhancing student learning outcomes. Types of research used is the study Research and Development (R&D) with ADDIE research model. This research was held at Madrasah Ibtidaiyah with a total of 30 participants. This research result shows that, (1) the development of e-book media based on flipbooks using the ADDIE development model with 5 stages. (2) media suitability is determined by the results data. Validation media expert 1 of 98.3% with description "very worthy", media expert 2 stage II is 100% with the description "very worthy". Material expert 1 is 95% with the description "very worthy" and expert material 2 is 100% with "very worthy" statement. (3) Improvement in learning outcomes is observed through pre-test and post-test data, analysed using the N-Gain calculation. N-Gain percent show gained 63.84 with criteria "sufficiently effective".

Keywords: Research & *Development; E-Book; Flipbooks; Learning Outcomes*; *Plane Figure*

Introduction

Education is an intentional effort to develop individuals' abilities and potential toward a better direction. This education is one of the factors the main thing that is very decisive quality life for a person and his nation. The educational process can foster innovative and creative ideas to condition the moment. Development curriculum is an instrument important to increase the level of education. "Kurikulum Merdeka" is the majority curriculum applied at this moment. "Kurikulum Merdeka" is seen as a teaching strategy that allows student Study with tenacity, calmness, passion and strength use show their talent experience.

Mathematics is universal language that expands thinking human, have application important in various field academic, and improve ability think. Therefore, that is all students, start from school base until school intermediate above, need accept education mathematics to develop ability think logical and skills solve problem in life every day. Learning outcomes is results from the learning process that has been taking place, usually measured from three aspects: cognitive, emotional, and psychomotor. In general, if a student show improvement in understanding, focus, and habit compared to task previously, then they considered has reach objective learning.

Instructional media are tools that can used by teachers for overcome challenge teach. With use it with right, teacher can make easier to convey draft to students and provide interesting lesson to be had inspiring they to learn. With using media with right, learning process become more interesting and effective.

Result of interview with the fourth grade's teacher at MI Al Irsyad Al Islamiyyah show that student own lack of ability in learning mathematics. Some people still consider mathematics too difficult. In the learning process in the classroom, the average method used is based on conventional teaching method, so that learning more leading to teacher learning. This is because of implementation curriculum independence which is classified as Still new to MI Al Irsyad Al Islamiyyah school. So, there are more teachers active in class and participant educate become passive. This is No in line with achievement curriculum independent Where should participant educate more active and teacher only play a role as facilitator.

Pre-observation results of fourth-grade students at MI Al Irsyad Al Islamiyyah revealed a lack of enthusiasm for learning mathematics. When the researcher entered the classroom to observe the mathematics lesson, some students expressed reluctance, saying, 'Please, ma'am, let's not study math,' or suggested, 'Can we study while playing, ma'am?' One student, referred to as 'KZ,' also mentioned that learning mathematics was quite difficult. This is consistent with research by Indofah (2023), which indicates that mathematics is perceived as difficult and intimidating due to several factors: (1) limited natural aptitude, (2) low self-confidence, (3) challenges in applying concepts to daily life, (4) complex formulas and rules, (5) frequent errors and uncertainty, and (6) the pressure of speed.

The media used in teaching is still limited to displaying YouTube learning videos via an LCD projector and using flashcards. In addition to these, teachers rely heavily on textbooks as the primary learning resource, though textbooks are often not distributed to students on time. With such limited media, students' understanding of mathematics, especially on topics like plane figures, remains abstract.

Given the issues above, there are still very few resources available for teaching mathematics effectively, particularly at MI Al Irsyad Al Islamiyyah. Researchers aim to implement and develop additional media to support teaching, enhance learning activities, and improve the learning outcomes of fourth-grade students. One example is the

flipbook-based e-book. Using digital books in class can spark students' curiosity and motivate them to explore topics more deeply.

This e-book, accessible on devices like laptops or mobile phones, is especially practical, as students today are more likely to engage with mobile devices than traditional textbooks. This media can help teachers introduce plane geometry concepts that are often not fully covered in class or easily understood by students. Besides containing instructional materials, the e-book developed by researchers includes engaging images that, when 'flipped' from one page to another, give the impression of animation.

Based on this background, researchers are interested in developing a flipbook-based e-book on plane geometry to enhance fourth-grade students' learning outcomes. Prior studies indicate that this type of e-book is both effective and relevant for use in elementary education, as it combines cognitive learning goals with an engaging, visually appealing format.

Methods

This study employs the ADDIE development model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model supports the development of various educational products, including instructional models, strategies, learning methods, media, and materials. According to Peterson (2003) as cited in Iswati (2019), this model is effective because it centers on participants from the analysis stage through to evaluation, actively involving students at every stage.

During the Analysis stage, observations and interviews with teachers were conducted to identify students' needs. In the Design stage, products were planned based on this analysis. The Development stage involved creating the flipbook-based e-book media, followed by Implementation, where the media was applied in the classroom to assess its suitability and impact on learning outcomes. The Evaluation stage involved reviewing each phase to improve the media. Data were collected through interviews with teachers and students, expert-validated questionnaires, and pre- and post-tests.

The study used several data analysis techniques: feasibility testing, homogeneity testing, normality testing, the Wilcoxon signed ranks test, and the N-Gain test. Feasibility testing, based on Sugiyono's criteria (as cited in Ma'aniyah), helped determine whether the media was suitable for classroom use. Validation data were gathered from media experts, content experts, teachers, and students to assess the media's quality, effectiveness, and areas for improvement.

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

Information:
P   = percentage score
f   = amount score obtained
N   = number score maximum

Table 1. Product Eligibility Information

Presentation Evaluation	Information
81 – 100%	Highly Suitable
61 – 80%	Suitable
41 – 60%	Moderately Suitable
21 – 40%	Minimally Suitable
0 – 20%	Not Suitable

Homogeneity test use to know two or more research data This originate from population whose variants The same or homogeneous. The Levene test formula is adopt in journal written by Sianturi (2022) with base taking decision as following.

a) If the value significance > 0.05 then can it is said homogeneous data distribution.
b) If the value significance < 0.05 then can it is said data distribution no homogeneous.

Normality test for determine is the research data normally distributed or none using the Shapiro-Wilk test adopt in journal written by Aminah with base taking decision as following.

a) If the value significance > 0.05 then can it is said that the data is normally distributed.
b) If the value significance < 0.05 then can said data not normally distributed.

Wilcoxon Signed Ranks Test is a non - parametric statistical test used for compare paired data samples. This test adopted from research conducted by Windi (2021) with criteria the test as following.

a) If the value significant (Asymp. Sig.) < 0.05 then H_0 rejected and its meaning there is difference.
b) If the value (Asymp. Sig.) > 0.05 then H_1 accepted and its meaning there is no difference.

N-Gain Test for see percentage effectiveness from e-book media based on flipbooks in increase understanding participant educate This with using the N-Gain score test with criteria acquisition adopted score from Farell's journal.

$$\text{N} - \text{Gain} = \frac{(\text{posttest score} - \text{pretest score})}{(\text{maximal score} - \text{pretest score})}$$

Table 2. N -Gain Score Category

Score	Information
N-Gain > 0.7	Tall
0.3 < N- Gain ≤ 0.7	Currently
N- Gain ≤ 0.3	Low

Table 3. Categories Interpretation Effectiveness of N-Gain

Presentation	Interpretation
< 40%	Ineffective
40 – 55%	Less Effective
56 – 75%	Enough Effective
>76%	Effective

Results and Discussion
Development E-Book Media based on Flipbooks using the ADDIE Model
Analysis Stage

At this stage, researchers analyse the creation of flipbook-based e-book media, designed according to curriculum analysis, the needs of students and educators, and the characteristics of fourth-grade students. From interviews conducted during the needs analysis, researchers found that students were not fully achieving their potential in mathematics and often considered it too difficult. Observations in the classroom revealed that students showed limited enthusiasm during mathematics lessons, where conventional lecture-based methods dominated, resulting in a teacher-centered approach. This approach is partly due to the relatively new implementation of the independent curriculum at MI Al Irsyad Al Islamiyyah.

The media used in teaching was still limited to viewing YouTube videos through an LCD projector and using flashcards. In addition to these, teachers relied heavily on textbooks as the primary learning source, which were often delayed in distribution to students. Given these conditions, researchers developed flipbook-based e-book media tailored to engage students more effectively and to serve as additional support for teachers and students, reducing dependence on delayed textbooks.

In the curriculum analysis stage, it was noted that the independent curriculum, especially in fourth-grade mathematics, includes content on plane geometry. Below are the Learning Achievement Objectives (CP) and Learning Objectives (TP) that will be implemented using the flipbook-based e-book media.

Table 4. Distribution of CP and TP Mathematics Class IV

Element	Geometry
Achievements Learning	At the end of Phase B, participants educate can describe characteristics various form get up flat (square, triangle, polygon). They can compose (composition) and breaking down (decomposition) various get up flat with more from One method if allows.
Learning objectives	1. Identifying aspect Lots regular and irregular regular based on its properties. 2. Calculate and solve related issues with area and circumference get up flat. Identifying connection interline use object concrete.

At this stage, the characteristics of the fourth-grade students are analyzed to increase their interest in learning, so that the quality of learning can improve by utilizing the facilities provided by the madrasah, in accordance with the needs of the students. The flipbook-based e-book media can be used by students to help them understand the content, offering a new experience that is different from traditional printed textbooks.

Design Stage

In the design stage, the flipbook-based e-book media is developed as a practical tool that can be easily carried anywhere, as it can be accessed using a laptop or mobile phone. The e-book is designed to be visually appealing, with full-colour pages, images, text, infographics related to specific topics, and HOTS (Higher Order Thinking Skills) standard questions. This media is specifically designed to enhance students' learning outcomes by presenting diverse perspectives. The e-book is formatted in A4 size with a background blend of purple and white. The fonts used include Poppins, Bevan, Comic Sans, Montserrat, and CS Gordon Serif. The e-book is created using the Canva Premium application, allowing for a wider variety of images and design elements.
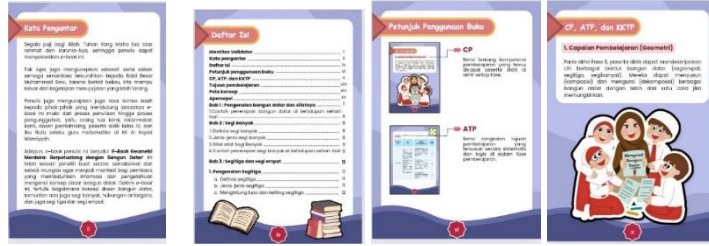
Development Stage

In this stage, the flipbook-based e-book, which was previously designed on Canva, is further developed to be more engaging and aligned with the analysis conducted earlier.

Table 5. *E-Book* Media Development Design Based on *Flipbooks*

No	Information	Appearance
1.	Front cover	

2.	Foreword, table of contents, instructions use books, CP, TP, and ATP	
3.	Material	
4.	Scan barcodes for interesting info and exercises question HOTS standard	
5.	Summary	
6.	Profile Writer	
7.	Cover behind	

In addition to development, the media is also validated by media and material experts. The results of the media validation are used to revise the media before it is applied to students to determine whether it is appropriate. Both experts rated it as "very feasible" in Stage I and "very feasible" in Stage II. The results of the material validation in this study received the statement "very worthy."

Implementation Stage

The trial using the flipbook-based e-book media was conducted in two stages: a small group and a large group. On May 22, 2024, five students from Class IV MI Al Irsyad Al Islamiyyah participated in the small group trial, and on May 29, 2024, 25 students from the large group participated. The trial included the use of pre-test sheets, post-test sheets, and student response questionnaires. The results from the pre-test and post-test sheets show an improvement in student learning outcomes before and after using the flipbook-based e-book media on plane structure material.

Evaluation Stage

At this stage, the researcher identified the need for clarification based on the math teacher's suggestions. In the design stage, improvements to the layout and e-book media material were made based on the mentor's suggestions. In the development stage, revisions to the draft materials and the selection of media components were made based on expert validator feedback. In the implementation stage, efforts are needed to ensure that all students understand the material on plane structures, based on the results of the data analysis. In the evaluation stage, the flipbook-based e-book media was determined to have successfully increased student learning outcomes and is deemed suitable for use.

Eligibility E-Book Media based on Flipbooks

The feasibility of flipbooks- based e-book media seen from results validation expert, response students, and teacher responses. Based on results validation the first media expert on May 9, 2024 by is known that mark maximum overall answer is 60 and media expert validator I provides value 59. Which is formulated in calculation following.

$$P = \frac{f}{N} \times 100\% = \frac{59}{60} \times 100\% = 98.3\%$$

So, from data acquisition results questionnaire media expert above by 98.3% with the description "very worthy" is used in accordance with the suggestions given. As for the criticism and suggestions given from first validator media expert as following.

1) More consistent using underline important words or block.
2) Take note use less pictures relevant.
3) More tables interesting If without contour.
4) Images give contour.
5) Take note location parts about, because found the question between questions and answers separated.

As for second validation media expert stage I known that mark maximum overall answer is 60 and media expert validator 2 stage I provides value 48. Which is formulated in calculation following.

$$P = \frac{f}{N} \times 100\% = \frac{48}{60} \times 100\% = 80\%$$

So, from data acquisition results questionnaire media expert above by 80% with the statement "fit" for use in accordance with the suggestions given. As for the criticism and suggestions given from second validator media expert stage I as following.

1) thickness in the image get up flat
2) There is an image that covers the writing or lines.
3) Instruction use book fixed.

Then, validator media expert 2 stage II was conducted on May 13, 2024 known that mark maximum overall answer is 60 and validator provides value 60. Which is formulated in calculation following.

$$P = \frac{f}{N} \times 100\% = \frac{60}{60} \times 100\% = 100\%$$

From the results validation first media expert known that results percentage obtained is 98.3% with very appropriate description. Then, validation second media expert stage I obtained 80% percentage with information feasible. The validation of the second media in stage II was obtained 100% percentage with description "very worthy ". So, we can conclude that e-book media based on flipbooks this is "very worthy" for tested try it.

Based on results analysis expert first validator material conducted on May 9, 2024 is known that mark maximum overall answer is 60 and expert validator material First give value 57. Which is formulated in calculation following.

$$P = \frac{f}{N} \times 100\% = \frac{57}{60} \times 100\% = 95\%$$

So, from data acquisition results questionnaire expert material first on top by 95% with the description "very worthy" is used in accordance with the suggestions given. The criticism and suggestions given by the expert validator material First as following.
1) Strengthen understanding related definition get up flat
2) Make it clear description example so as not to happen misconception.

Validation expert material second done on May 20, 2024 known that mark maximum overall answer is 60 and expert validator material second give value 60. Which is formulated in calculation following.

$$P = \frac{f}{N} \times 100\% = \frac{60}{60} \times 100\% = 100\%$$

From the results validation expert material First known that results percentage obtained is 95% with description "very worthy ". Then, validation expert material second obtained 100% percentage with description "very worthy". So, we can concluded that the material contained in the e-book media based on flipbooks this is "very worthy" for tested try it.

As for the results questionnaire response participant trial education group small known that as following.

Table 6. Questionnaire Data Response Small Group Trial Students

No	Student Code	Statement					Score (f)	Max Score (n)	Percentage
		1	2	3	4	5			
1.	AN AF	1	1	1	1	1	5	5	100%
2.	EIAM	1	0	1	1	1	4	5	80%
3.	FFI	1	1	1	1	1	5	5	100%
4.	AAC	1	1	1	1	1	5	5	100%
5.	NRM	1	1	1	1	1	5	5	100%
	Amount						24	25	96%

Based on table 6, know that results questionnaire response participant educate obtained score answer is 24 and the score maximum is 25. So, we get results as following.

$$P = \frac{f}{N} \times 100\% = \frac{24}{25} \times 100\% = 96\%$$

From the calculations above, we obtain 96% percentage with the statement "very worthy" can be stated that e-book media based on flipbooks accept positive response from participant educate and fit for tested try it on a big group.

Meanwhile, in the trial big group known that questionnaire response student gets results 109 and the maximum score is 125. So, obtained results as following.

$$\frac{109}{125} \times 100\% = 87.2\%$$

Based on the calculations above, this flipbooks- based e -book media accept positive response from trial participants group bi, with percentage 87.2% with "very

worthy" statement. Therefore that, this flipbooks -based e-book media is "very worthy " for applied to students grade IV.

In addition to using the results data validation media expert, expert material, response participant trial education small group, trial big group, researchers also use questionnaire teacher response as following.

Table 7. Questionnaire Data Teacher Response to Large Group Trial

Respondents	Statement					Score (f)	Max Score (n)	Percentage
	1	2	3	4	5			
1	4	4	3	4	3	18	20	90%

Based on table 7, we can know that results questionnaire teacher response obtained score answer is 18 and the score maximum is 20. So, we get results as following.

$$P = \frac{f}{N} \times 100\% = \frac{18}{20} \times 100\% = 90\%$$

As results from the calculation above, the percentage is 90 % with the description "very worthy " shows that this e-book media is based on flipbooks accepted with well by the teacher. Therefore that, this flipbooks -based e-book media is "very worthy" for used on students of grade IV of MI Al Irsyad Al Islamiyyah, Kediri City.

Effectiveness Use E-Book Media based on Flipbooks

Homogeneity test done to know whether There is or whether or not difference variance between two or more group. If the value significance (sig) more from 0.05, the data distribution is considered homogeneous. On the other hand, if mark significance not enough from 0.05, the data distribution is considered No homogeneous. Homogeneity test done here.

According to Table 14, homogeneity test results show score mark significance (sig) 0.012 < 0.05. Therefore that, value significance (sig) below 0.05 indicates that the data is not distributed in a way homogeneous.

One of method for determine whether distribution of pre-test and post-test data is normal is a test of normality. The significance value (sig) is greater from 0.05 shows that the data is normal; otherwise, the value significance below 0.05 indicates that the data not normal. Normality test results researcher seen here.

Table 7. Homogeneity of Variances Test Results

		Levene Statistics	df1	df2	Sig.
Student_Score	Based on Mean	6,853	1	48	.012
	Based on Median	3.358	1	48	.073
	Based on Median and with adjusted df	3.358	1	45,443	.073
	Based on trimmed mean	7,362	1	48	.009

According to Table 7, homogeneity test results show score mark significance (sig) 0.012 < 0.05. Therefore, value significance (sig) below 0.05 indicates that the data is not distributed in a way homogeneous.

One of method for determine whether distribution of pre-test and post-test data is normal is a test of normality. The significance value (sig) is greater from 0.05 shows that the data is normal; otherwise, the value significance below 0.05 indicates that the data not normal. Normality test results researcher seen here.

Table 8. Normality Test Results

	Kolmogorov-Smirnov [a]			Shapiro Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Pretest_25	.229	25	.002	.916	25	.042
Posttest_25	.334	25	.000	.799	25	.000

a. Lilliefors Significance Correction

Researcher using non-parametric normality test to dealing with invalid data normally distributed, because mark significance (sig) pre-test 0.042 < 0.05 and value significance (sig) post - test 0.000 < 0.05, as shown in table 8.

Wilcoxon signed ranks test was used for determine whether There is difference between two paired data. The results of this test shown below.

Table 9. Wilcoxon Signed Ranks Results

		N	Mean Rank	Sum of Ranks
Posttest_25 - Pretest_25	Negative Ranks	0 a	.00	.00
	Positive Ranks	25 b	13.00	325.00
	Ties	0 c		
	Total	25		

a. Posttest_25 < Pretest_25
b. Posttest_25 > Pretest_25
c. Posttest_25 = Pretest_25

A total of 25 students with ranking negative no show decline from pre-test to post-test, according to Table 9. On the other hand, as many as 25 students with ranking positive show improvement with an average of 13.00 and a total rating of 325.00 from pre-test to post-test. Therefore that, can concluded that There is improvement from pre-test to post-test.

Table 10. Test Results Statistics Wilcoxon Signed Ranks

	Posttest_25 - Pretest_25
Z	-4.413 b
Asymp . Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Significance value (sig) of 0.000 is the same with 0.05, as shown in Table 10. If H0 is rejected while H1 is accepted, this in accordance with base taking decision. So, the value student before and after using different flipbooks - based e-book media.

As for the results pre - test and post- test obtained during the trial group small is as following.

Table 11. Pre-Test and Post-Test Data for Small Group Trials

No	Student Code	Mark Pre-Test	Mark Post-Test	Post - Pre	Ideal Score (100) - Pre	N-Gain Score	N-Gain Score Percentage
1.	AN AF	55	90	35	45	0.77	77.00
2.	EIAM	70	80	10	30	0.33	33.00
3.	F.FI	55	95	40	45	0.88	88.00
4.	AAC NO.	75	95	20	25	0.8	80.00
5.	NRM	50	90	40	50	0.8	80.00

Table 18 shows that the average pre-test score was 61, while the average post-test score increased to 90, indicating improvement This is can concluded there is improvement results Study participant educate with the implementation of e-book media based on flipbooks and classified as effective for used in learning so that can continue on trial big group.

In addition, based on the N-Gain Score known that average value of pre-test and post-test of trial group small is 0.716 so can categorized as "high" because it is > 0.7. And N-Gain percent the average value earn 72.00 with "sufficient" criteria effective" because show existence improvement results Study participant educate after the implementation of e-book media based on flipbooks.

After do a trial group small, then furthermore researcher conduct group tests big with do question pre-test and post-test to know their level understanding.

Table 12. Pre-Test and Post-Test Data for Large Group Trial

No	Student Code	Mark Pre-Test	Post-Test	Post-Pre	Ideal Score (100) - Pre	N-Gain Score	N-Gain Score (%)
1	AZ FW	70	95	25	30	0.83	83.00
2	AF FP	55	80	25	45	0.55	55.00
3	A. NR	70	90	20	30	0.66	66.00
4	A. RP	55	80	25	45	0.55	55.00
5	AA PA	50	95	45	50	0.9	90.00
6	A. TA	30	80	50	70	0.71	71.00
7	A. ZR	70	95	25	30	0.83	83.00
8	A. LF	70	95	25	30	0.83	83.00
9	A. KB	40	75	35	60	0.58	58.00
10	B. AG	70	95	25	30	0.83	83.00
11	BAM	45	75	30	55	0.54	54.00
12	FM FA	55	80	25	45	0.55	55.00
13	L.TV	50	80	30	50	0.6	60.00
14	MY MD	75	95	20	25	0.8	80.00
15	M.HS	55	80	25	45	0.55	55.00
16	MA NN	55	80	25	45	0.55	55.00
17	MA IN	75	90	15	25	0.6	60.00
18	MA AP	50	80	30	50	0.6	60.00
19	M.O.F	55	90	35	45	0.77	77.00
20	ND AA	80	90	10	20	0.5	50.00
21	N.ZL	70	80	10	30	0.33	33.00
22	R.ZG	50	80	30	50	0.6	60.00
23	SAM	50	75	25	50	0.5	50.00
24	ZKM	50	80	30	50	0.6	60.00
25	Z.FP	50	80	30	50	0.6	60.00
Average		57.8	84.6			0.6384	63.84

Based on the data in table 12. it can be known that average value of pre-test trial group big is 57.8 and the post-test average is 84.6. This is can concluded there is improvement results Study participant educate with the application of e-book media based on flipbooks and is classified as " sufficient " effective" for used in learning.

In addition, based on the N-Gain Score known that average value of pre- test trial group large and post- test trials group big is 0.6384 so can categorized as "moderate" because 0.3 < G ≤ 0.7. And N-Gain percent the average value gained 63.84 with criteria "sufficient effective" because show existence improvement learning outcome of student after the implementation of e-book media based on flipbooks. Classified "sufficient effective" because each students have different study method, so that no all student active in learning and can understand material get up flat with good.

Conclusion

The researchers began with the idea of developing flipbook-based e-book media to enhance students' understanding of geometric shapes. From the beginning of the analysis and design stages, students participating in the course showed increased engagement. The development stage was based on students' needs, and during the implementation and evaluation stages, students were actively involved. This research

uses the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation.

The results of the analysis show that the flipbook-based e-book media is "very feasible" for a trial test. The analysis also reveals that the e-book media received positive feedback from material experts. Data analysis from the pre-test and post-test shows an improvement in student learning outcomes. The average pre-test score was 57.8, while the average post-test score was 84.6. The N-Gain value for the large trial group is 0.6384, which is categorized as "medium" because $0.3 < G < 0.7$. The average N-Gain percentage for the large trial group is 63.84%, which meets the requirement of being " Enough Effective." However, since each student has a different learning method, not all students were equally active in learning and some students did not fully understand the material on geometric shapes as effectively as others.

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