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DEVELOPMENT OF POP-UP BOOK LEARNING MEDIA FOR NATURAL SCIENCE SUBJECTS IN CLASS III OF MADRASAH IBTIDAIYAH

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Abstract

Developing learning media is one of the teacher's efforts to achieve learning goals. In developing a learning media, appropriate procedures are needed to produce a product in the form of valid and effective learning media. The development of pop-up book media for science subjects was conducted to determine its feasibility based on the assessment of material experts and media experts, as well as wanting to know the effectiveness of pop-up book learning media for science subjects. This research uses development research with development procedures following the ADDIE model, which includes analysis, design, development, implementation, and evaluation steps. The research was carried out at MIN 1 Bener Meriah by taking samples from class 3. Data collection techniques used observation, interviews, questionnaires, documentation, and tests. Data analysis techniques include qualitative and quantitative data analysis. The findings of this research are: first, from the validity test by material experts, the results were 4.1 in the valid category, and second, from media experts, the results were 4.4 in the very valid category. Second, based on the effectiveness test using pretest and posttest techniques, the N-Gain test results were obtained at 0.61 with a moderate level of effectiveness, so it can be stated that the pop-up book learning media for science subjects is effective for use in learning. This research and development is still limited to MIN 1 Bener Meriah, so further research must be implemented in Madrasah Ibtidaiyah.

Keywords: Learning Media, Pop-up book, Natural Sciences

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INTRODUCTION

The understanding of science topics among elementary school students can be challenging, which may result in reduced interest and academic performance (Wartika & Prahasdito, 2018). Traditional teaching methods often fail to engage students, leading to poor comprehension of Natural Science topics (Azzahra & Ninawati, 2024). In addition, the lack of interactive and visually stimulating materials contributes to students' disinterest in learning (Putra & Witari, 2024). To address this issue, teachers must be more innovative in learning media, such as using pop-up book media.

Pop-up books are a unique and interactive form of learning media that can bring scientific concepts to life, making them more accessible and engaging for young students (Noviyanti & Margunayasa, 2020). The three-dimensional nature of pop-up books can create a more immersive learning experience, helping students better visualize and retain the information presented (Fatthurrahma & Anas, 2023). Therefore, developing and using pop-up book learning media for Natural Science subjects in Class III of elementary schools addresses significant educational challenges, including low student engagement, understanding, and motivation in learning (Fani Handini Riana & Lilik Hidayat Pulungan, 2024). This innovative approach has garnered attention for its potential to enhance learning experiences.

Although pop-up books present a promising avenue for enhancing learning, teachers may require additional training to effectively integrate this medium into their teaching practices (Maulia et al., 2024). In addition, production costs and accessibility have become barriers for many schools (Olvi Steva Surentu et al., 2024). Therefore, given the pressing need for effective teaching materials, further research into pop-up books could improve educational outcomes and foster a more engaging learning environment for students in Natural Science subjects (Fani Handini Riana & Lilik Hidayat Pulungan, 2024).

The learning process is a communication process in a system, so learning media occupies an important position as a component of the system learning. Without media, communication will not occur, and the learning process will not be able to take place optimally. Learning media is an integral component that cannot be separated from the learning system. Position of understanding media as a communication component (Suwarno et al., 2022). The communication process will run effectively and efficiently when interpreting code runs quickly and precisely. This can happen if there are internal disturbances/obstacles to minimizing communication. (Awalia Putri, 2020). The role of media in learning is to reduce obstacles in the learning process so that maximum learning outcomes are achieved. (Azhar, 2020). In the process of learning, media has a function as a carrier of information from the source (teacher) to the recipient (student) (Hasan et al., 2021).

Learning media can convey everything that can be used for delivering or conveying material from the teacher in a planned manner so that students can learn effectively and

efficiently. (Suwarno, Ismet Nur, Rahmanita Zakaria, 2022). In this case, learning media is everything used must stimulate thoughts, feelings, attention, and abilities or skills students process to encourage learning. (Kandia et al., 2023). If explained in more detail, learning media in the form of materials, tools, or techniques used in learning activities teaching with the intention that the process of educational communication interaction between teachers and students can be achieved takes place scientifically, interactively, effectively, and efficiently. (Anisa et al., 2021).

In the 3rd class Natural Sciences (IPA) learning process at Madrasah Ibtidaiyah Negeri (MIN) 1 Bener Meriah, students are less active and tend to only listen to the teacher's explanation, so their learning experience is lacking. Based on the results of observations made at MIN 1 Bener Meriah, it was found that students had difficulty understanding the material provided by the teacher, especially when students were studying science subjects. Difficulty in understanding this material can be seen from the student's lack of focus in listening to their teacher's explanations, and they often even chat and joke with their friends. (Citra Amalia Sulubere, 2022c). From this problem, the author became interested in developing learning media in pop-up books for science subjects to increase students' interest in learning. As Tri Hesti Sinta Dewi et al. stated, teachers need to develop learning media to encourage student's interest in learning. (Hesti & Dewi, 2018). Apart from that, as educators, teachers must continue to innovate as a matter of professionalism. (Yunus et al., 2023).Top-up books are a form of learning media in visual form. Pop-up book media is a book that has three-dimensional elements and can move when the pages are opened. It has a beautiful image display and can be erected, provides development of student creativity, and stimulates the imagination. (Jannah & Sukidi, 2018).

Research on pop-up book media in education has shown promising results, yet several limitations persist. Previous studies often focus on specific subjects or grade levels, limiting generalizability. For instance, Ainiyah et al. (2022) highlighted improvements in fifth graders' learning outcomes but did not explore broader applicability across different subjects or age groups. Similarly, Nuranafi et al. (2022) emphasized critical thinking in Civics, neglecting other disciplines. In addition, the difference between the research by Dwi Oktaviana et al. (2020) and the author's research is that Dwi Oktaviana et al. (2020) used the Thiagarajan development model, while the author used the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model. Based on these differences, it is still possible for the author to carry out this research. Previous studies also involve small sample sizes and do not assess the long-term impacts of pop-up book media on learning outcomes (Novitasari et al., 2024).

The novelty of this sudty is the use of the ADDIE model ensures a systematic development process that includes analysis, design, and evaluation, which is less emphasized in prior research. In addition, by focusing on science subjects for third graders, this research aims

to fill gaps left by previous studies, potentially offering insights applicable to various educational settings. This study aims to determine the validity and effectiveness of the pop-up book learning media on butterfly metamorphosis due to development in class 3 at MIN 1 Bener Meriah.

METHODS

This research uses a type of development research. Development research is a research method used to produce certain products and the effectiveness of the products produced (Sugiyono, 2019). In this research, the product produced is a pop-up learning media for class 3 science subjects. The research procedure uses the ADDIE model, which consists of five stages of the development process: Analysis, Design, Development, Implementation, and Evaluation (Hidayat & Nizar, 2021). The following is a picture of the development of the ADDIE model.

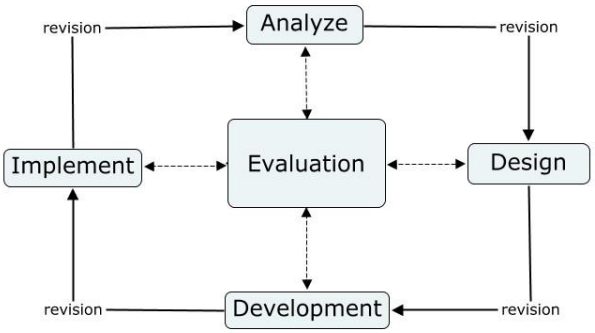


Figure 1: ADDIE model development procedure.

First, Analysis: At this stage, the main activity is analyzing the need to develop learning media. In this analysis activity, the author carried out an analysis of student needs, an analysis of teacher needs, and an analysis of infrastructure. The second is design. At this stage, the author creates an initial design for pop-up book learning media for science subjects. Third, Development. At this stage, the author carried out product development in the form of pop-up book media for science subjects. At this stage, the product validation was also carried out as pop-up book learning media for science subjects by media experts and material experts. In the fourth implementation stage, at stage, the author conducted a product co-test in the form of a pop-up book learning media for science subjects for class 3 MIN 1 Bener Meriah students. Fifth is evaluation. In the research and development of the ADDIE model, the final stage is evaluation. At this stage, the author makes improvements to the product in the form of pop-up book learning media for science subjects; if in the previous stage, namely Implementation, there are deficiencies, but if there are no deficiencies, then this product will be disseminated widely (Branch, 2009).

The research was conducted at MIN 1 Bener Meriah in class 3 from June to November 2022. Data collection techniques in this development research were carried out using observation, questionnaires, documentation, and tests. Data analysis uses qualitative analysis and quantitative analysis. Qualitative analysis is used to analyze data resulting from needs analysis. Meanwhile, quantitative analysis is used to analyze data from expert validation and product trials in the form of pop-up book learning media for science subjects.

RESULTS AND DISCUSSION

1. Analysis

Analysis activities include analysis of teacher needs, student needs, and infrastructure analysis. This analysis is used as a basis for developing pop-up book learning media.

a. Teacher Needs Analysis

In conducting this teacher needs analysis, the author made observations regarding whether or not the development of learning media was necessary. Observations were carried out by paying attention to students' classroom teaching and learning activities. In observation activities carried out at schools, it was found that teaching and learning activities focused on the teacher as a source of information and books and blackboards as the main learning media, so students became less attentive and talked to themselves during learning time. (Citra Amalia Sulubere, 2022c). This encourages researchers to develop a learning media product to support school teaching and learning activities. The development of this learning media is of course to create a learning atmosphere that is more enjoyable and memorable for students.

b. Student Needs Analysis

Student needs analysis activities are carried out by distributing questionnaires to students. The questionnaire distributed to research objects was in the form of a closed questionnaire to determine students' needs regarding whether or not learning media was necessary as an important learning tool to support the success of teaching and learning activities. Of the 30 students, 27 students agreed to develop learning media, and three students gave an answer that disagreed, so that the percentage of 90% of students wanted media development, and 10% did not want it. The following is a percentage table of the results of the analysis of student needs.

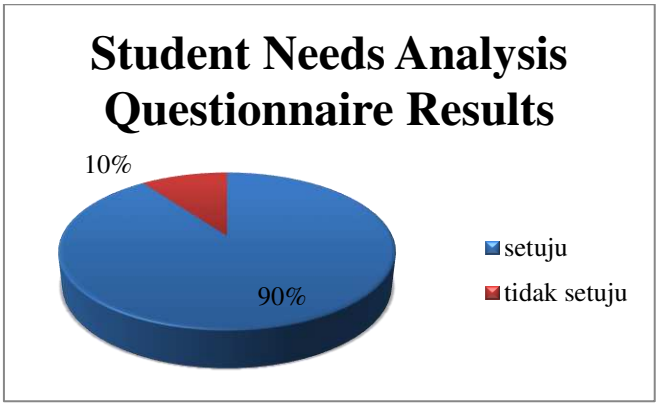


Figure 2: Results of the Student Needs Analysis Questionnaire (Citra Amalia Sulubere, 2022a)

c. Material Analysis

Material analysis is carried out to determine the material and the suitability between the developed media and the existing material. This activity also aims to help students achieve learning objectives in teaching and learning activities after using the product being developed. The following is a table of results for the material analysis.

Table 1. Basic Competencies, Indicators, and Learning Objectives

Number.	Subject Matter	Competence Base	Indicator	Learning objectives
1.	Animal Life Cycle	3.4 Pay attention to text vocabulary regarding characteristics, needs (food and living space), growth, and development of living things in the local environment. These are presented in oral, written, and visual form and environmental exploration. 4.4 Present a report on the concept of characteristics, needs (food and living space), growth, and development of living things in the local	3.4.1 Identify the main idea from the information presented about the growth and development of butterflies.	1. After observing the pop-up book, students can write down the main points of information presented about the growth and development of butterflies correctly.

Number.	Subject Matter	Competence Base	Indicator	Learning objectives
		environment in writing using standard vocabulary and effective sentences.		
			. 4.4.1 Write down the main points of information presented about butterflies	2. After observing the pop-up book, students can understand butterflies' growth and development stages well.

d. Analysis of Facilities and Infrastructure

From the results of observations regarding school facilities and infrastructure, it was found that the school has learning facilities in the form of buildings and classrooms, which are currently in the stage of repair, and classrooms are being added to suit the capacity of all students. The classroom used for research has sufficient lighting quality, which supports the use of the developed pop-up book learning media. (Citra Amalia Sulubere, 2022c).

The analysis stage is the first step in research into the development of the ADDIE model. So, to get a quality development product, development procedures must be carried out according to the theory put forward by experts. As Dewi Lestari Wardani et al argue, the development of learning media is carried out in several stages, by the instructional design model used. (Wardani et al., 2019). Romualdi et al. also expressed that a development procedure called instructional design is needed to develop learning media. (Romualdi et al., 2023). Instructional design is a systematic procedure for developing and compiling educational programs that aim to increase effective learning. (Erlin Eveline et al., 2019).

In general, the first stage in developing learning media is conducting a needs analysis (Abdulah & Wangid, 2021). Needs analysis is a systematic process for determining goals, identifying actual and expected conditions, and setting action priorities (Yuliana et al., 2021). According to Nadzeri et al. The term needs analysis generally refers to activities that involve collecting information to identify the needs of a group of students (Nadzeri et al., 2023). Needs analysis in developing learning media is conducted to determine students' assessments of the learning media used and expectations for the learning media that will be created (Lapele, 2019). By conducting a needs analysis in developing learning media,

designers will better understand the gaps between the desired results and the knowledge and skills that students already possess (Marpanaji et al., 2018). So that the learning media will be made more appropriate to existing needs based on problems identified through needs analysis

1. Design

The activities for designing the pop-up book learning media that will be developed are as follows: First, the author determines the material, competency standards, basic competencies, and learning objectives. Second, the author determines learning strategies that suit the characteristics and needs of students. Third, prepare a learning implementation plan (RPP). Fourth, determine the tools and materials that will be used to make the product. Fifth, assemble the product. The materials used in creating the pop-up book product design for class 3 science subjects are shown in the following table:

Table 2. Tools and Materials Pop-up book

Number.	Tools and materials	Information
1.	Cardboard box	Cut into one piece 35x30 cm
2.	Ruler	One piece
3.	Scissors and Cutter	1 piece each
4.	Double tip	Two pieces
5.	Paper glue	One piece
6.	Thick printing paper	20 pieces
7.	White cardboard	Three pieces
8.	Color cardboard	One piece
9.	Picture	20 images related to the material
10.	Color Markers	1 set
11.	Origami paper	One pack

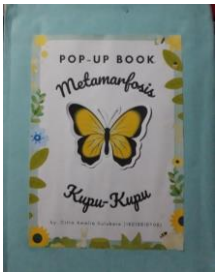
From the material above, the author then created a product design in the form of a pop-up learning media book for science subjects with the following display example:

Figure 3. Initial product design

2. Development

Development in research and development of the ADDIE model is a product realization activity that has been previously designed. Examples of product displays that have been developed are as follows:

Table 3. Developed Pop-up Book results

Number	Contents	Information
1.		Cover *pop-up book*
2.		Pages 1 and 2 briefly explain the egg phase in butterfly metamorphosis.
3.		Pages 3 and 4 briefly explain the butterfly metamorphosis's larval (caterpillar) phase.
4.		Pages 5 and 6 which contain a brief explanation of the pupa (cocoon) phase in butterfly metamorphosis
5.		Pages 7 and 8 briefly explain the imago (adult animal) phase in butterfly metamorphosis.

6.		Pages 9 and 10 contain a summary of the metamorphosis phases of butterflies.

The way to use the developed pop-up book learning media product is by simply opening each page of the book and reading the information or short material presented.

After the pop-up book learning media has been developed, expert validation is then carried out to assess the feasibility of the learning media being developed. Two experts assessed this pop-up book learning media: the material expert, Mr. Mustafa Kamal Nasution, M.Ed, and the learning media expert Mr. Awal Kurnia Putra Nasution, M.TPd.

Material expert validation was carried out two times. The first validation was carried out on July 1, 2022. In the first validation, the results stated that the pop-up book learning media developed was still invalid. The material validator's suggestion for the first validation was to improve the grammar of the pop-up book learning media being developed, to make it easier for children to understand the information available in the pop-up book learning media being developed.

After revisions were made based on material expert suggestions, validation was then carried out on July 20, 2022. In the second validation, results were obtained after making improvements to the grammar and strengthening the content of the pop-up book learning media material which was developed by bringing learning tools in the form of a syllabus and lesson plans. Media validation with valid criteria from material experts. (Citra Amalia Sulubere, 2022b). So the pop-up book learning media developed meets the feasibility in terms of material to be implemented.

Then validation by media experts was carried out three times. Learning Media Validation was carried out by media experts for the first time on July 6, 2022. Based on the first validation results, the results were less valid. According to the learning media validator, the components of the pop-up book learning media being developed have a color composition that is too monotonous, which makes children and teachers not interested in reading the pop-up book learning media being developed. Apart from that, the materials used as the basic materials for making the developed pop-up book learning media are still easily damaged when used and if they get wet. The basic material of a pop-up book made of cardboard does not suit the character of a very active lower-class child. So, the suggestion from the validator was to change the color composition and improve the basic materials for developing the pop-up book learning media.

The second validation was carried out on July 13, 2022. Based on the results of the second validation, it was found that the pop-up book learning media developed was quite valid. This is because this validation also requires learning tools in the form of a syllabus and lesson plans to assess the validity of the media with the existing material. So the suggestion obtained at this second validation stage is to complete the pop-up book learning media developed with learning tools in the form of a syllabus and lesson plans that show class III SD/MI material.

The third validation was carried out on July 20, 2022. After completing the pop-up book learning media developed with learning tools in the form of Siabus and Rpp, the pop-up book learning media developed received very valid criteria (Sulubere, 2022a). So, based on the results of the developed pop-up book learning media, it meets the feasibility of media being implemented in learning. The following is a table of validation results from material experts and media experts for the pop-up book on science subjects that was developed.

Table 4. Assessment Results by Validators or Material Experts and Validators or Learning Media Experts

No	Penilai	Tahap Validasi	Skor	Rata-rata Skor	Kriteria
1.	Ahli Materi	I	16	2,67	Cukup Valid
		II	25	4,1	Valid
		III	-	-	-
2.	Ahli Media	I	35	2,7	Cukup Valid
	Pembelajaran	II	39	3,0	Cukup Valid
		III	57	4,4	Sangat Valid

Based on the table above, the validation results from material experts and learning media experts can be depicted in the following diagram:

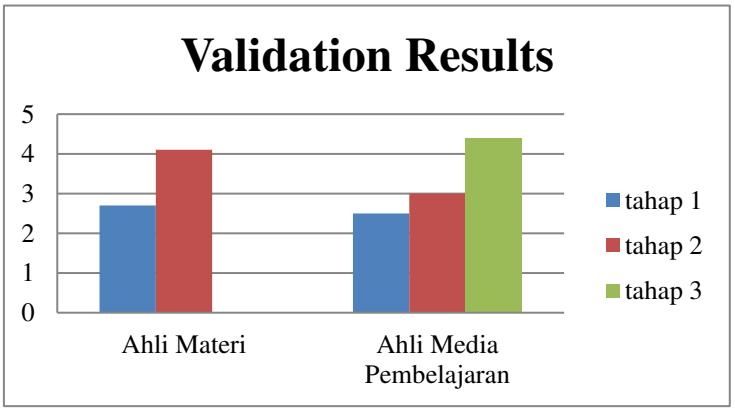


Figure 4. Expert Validation Results Diagram

3. Implementation

At this stage, the pop-up book learning media product that was developed and validated is used in teaching and learning activities. This stage was carried out to determine the effectiveness of the pop-up book learning media being developed. To determine the effectiveness of the developed pop-up book learning media, the researcher conducted a pre-test before using the pop-up book learning media and a post-test after using the pop-up book learning media.

Pretest questions are given before learning activities are carried out using pop-up book learning media, which was developed to contain five questions with a minimum score of 0 and a maximum score of 100. The Minimum Completeness Criteria (KKM) determined by MIN 1 Bener Meriah for science subjects is 60. Of the 30 students, 20% of students got a score of 0, 7% of students got a score of 20, and 20% of students got a score of 40, this score is a score below the minimum completeness criteria, so it can be seen that there are 47% of students who have not achieved completeness, while those who have achieved completeness as much as 53% (Sulubere, 2022c). Student scores at the pre-test stage are depicted in the following diagram:

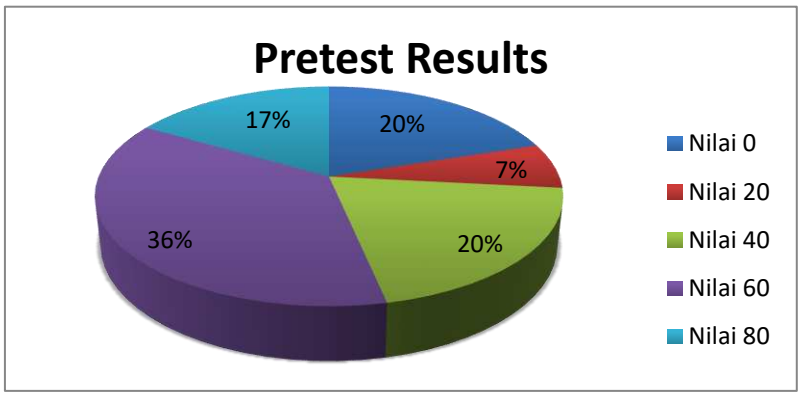


Figure 5. Pretest Results Diagram

Next, science learning is carried out using pop-up book learning media. After the students received treatment through the learning process using the pop-up book learning media that was developed, a post-test was carried out to test the student's understanding as well as the effectiveness of the pop-up book learning media that was developed. The results of the post-test consisted of five questions given. To 30 class III students. From the post-test results, it is known that 33% of students got a score of 60, 50% of students got a score of 80, and 17% of students got a score of 100 (Sulubere, 2022b). These results show that all students have achieved learning mastery, so it can be said to be a pop-up book learning media. Developed effectively. The post-test results can be depicted in the following diagram:

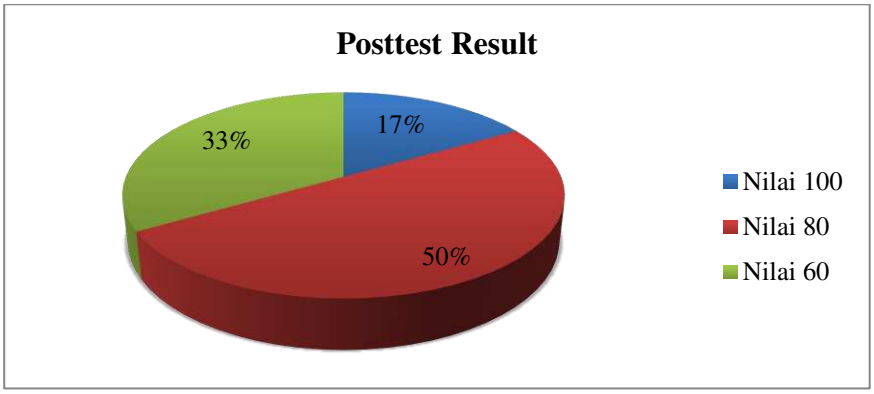


Figure 5. Posttest Results Diagram

The pre-test and post-test results are then processed using statistical data processing. Following are the pre-test and post-test results that have been processed.

Table 5. N-Gain test results

No	Nama	*Pretest*	*Posttest*	Selisih	N-Gain	Kriteria
1.	Adelia Ramadhani	20	80	60	1,5	Tinggi
2.	Aditia	0	80	80	1	Tinggi
3.	Aidil	40	60	20	0,3	Sedang
4.	Alfatih	0	60	60	0,67	Sedang
5.	Aqila	60	100	40	1	Tinggi
6.	Ariqa Sakhi A	60	80	20	0,5	Sedang
7.	Cahya Salsabila	40	80	40	0,67	Sedang
8.	Chintia	60	80	20	0,5	Sedang
9.	Dafa Kenara	60	80	20	0,5	Sedang
10.	Deswita Khajwa	80	100	20	1	Tinggi
11.	Dhiya	60	80	20	0,5	Sedang
12.	Diva Amelia Siran	80	100	20	1	Tinggi
13.	Farel	20	60	40	0,5	Sedang
14.	Fathan Al Azfar	80	100	20	1	Tinggi
15.	Habib Reynako	20	60	40	0,5	Sedang
16.	Habiburrayyan	60	80	20	0,5	Sedang
17.	Kesya Haura	0	60	60	0,6	Sedang
18.	Khanza	40	60	20	0,3	Sedang
19.	Lidiya	0	60	60	0,6	Sedang
20.	Mauliana	80	100	20	1	Tinggi
21.	Munawir	0	60	60	0,6	Sedang
22.	Mutawali	60	80	20	0,5	Sedang

No	Nama	*Pretest*	*Posttest*	Selisih	N-Gain	Kriteria
23.	Nurul Magfirah	60	80	20	0,5	Sedang
24.	Rifki Mutuahmiko	40	80	40	0,8	Tinggi
25.	Rizki	60	80	20	0,5	Sedang
26.	Sahri	60	80	20	0,5	Sedang
27.	Salpi	40	60	20	0,3	Sedang
28.	Shakila Letisya	60	100	40	1	Tinggi
29.	Zahany	0	60	60	0,6	Sedang
30.	Zaki Mirza	40	80	40	0,67	Sedang

Based on the processed pretest and posttest results, nine students had high N-Gain criteria and 21 other students had medium N-Gain criteria. The N-gain test results can be depicted in the following diagram:

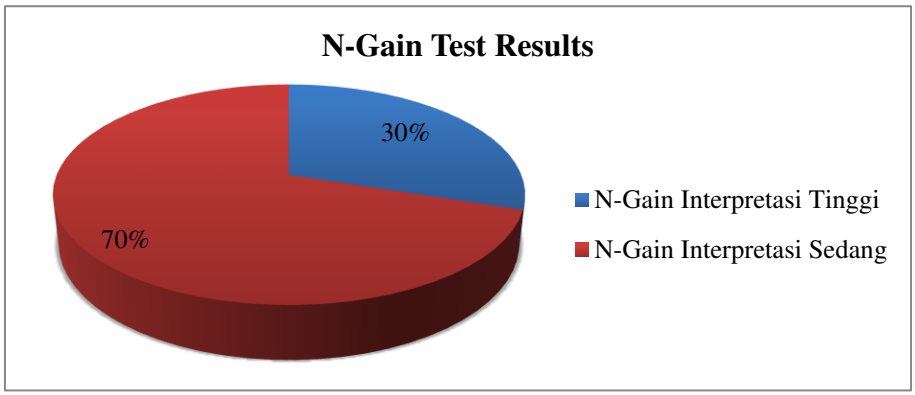


Figure 5. N-Gain Test Results Diagram

From the diagram above, it can be said that there is an increase in student learning outcomes after learning activities using pop-up book learning media were developed with the average student getting medium and high N-Gain criteria. 70% with medium criteria and 30% with high criteria. Based on these results, using pop-up book learning media for science subjects in teaching and learning activities meets the criteria for effectiveness.

4. Evaluation

The evaluation stage is the final stage in developing the ADDIE model. At this stage, the evaluation of the use of learning media will be revised if the pop-up book learning media used in learning is ineffective. However, no revision will be carried out if it is effective. At the implementation stage, it was discovered that the pop-up book learning media for science subjects was effective, so the author did not make revisions during this evaluation stage that the

science subject pop-up book learning media product developed has been completed through all stages and can be disseminated to all schools at the Madrasah Ibtidaiyah level.

The results of this research support the research of Sunarti et al., which states that pop-up book media is effective in improving the reading skills of grade 2 elementary school students (Sunarti et al., 2023), also supports the research results of Muhamad Afandi et al. which states that it is a learning media pop-up books are feasible, practical and effective for use in learning (Afandi et al., 2021). Apart from that, this research also supports the results of Oktaviana et al., who stated that CTL-based pop-up book media can facilitate students' problem-solving achievement (Oktaviana et al., 2020).

Then, in terms of feasibility, this research supports research results from Dewanti et al., who stated that pop-up book media is very suitable for use in thematic learning of the sub-theme of the environment where I live. (Dewanti, Handaruni, 2018). It also supports research results from Sinta Maria, which states that pop-up book media is suitable for developing nationalist character in elementary school Social Sciences (IPS) lessons. (Dewi et al., 2021). Then, it also supports the research results of Anggraini et al., who stated that the pop-up book learning media integrated with the Koran was in the very feasible category. (Anggraini et al., 2019). In addition to supporting research by Moh Komari et al., it is categorized as valid based on expert validation of top-up book learning media to improve student learning outcomes. (Komari et al., 2022).

Learning media are tools or facilities used in learning (Shalawati et al., 2022). It is hoped that the learning media used can help convey information and facilitate learning to students (Junaidi, 2019). The function of media in learning is to create a pleasant atmosphere, which impacts increasing student learning motivation and teacher professionalism (Gunawan, 2019). Muhammad Ramli describes, more specifically, that learning media is a tool that conveys or delivers learning messages (Ramli, 2012). Various kinds of learning media can be used in the learning process. Some are print media, such as books, props, or models, or digital media, such as video, animation, multimedia presentations, or interactive applications (Rusydiyah, 2019).

Using learning media in the teaching and learning process is useful for arousing students' curiosity, generating motivation, and stimulating teaching and learning activities, thus psychologically influencing students (Miftah, 2013). Learning media can also help the learning process and delivery of learning material so that the teaching and learning process becomes more effective (Fitra & Maksum, 2021). Besides that, learning media can also help students improve understanding, present interesting subject matter, and make it easier to receive subject matter (Azhar, 2020). Using appropriate and varied learning media can overcome students' passive attitudes, making the learning process more interesting and enjoyable (Wahyuliani et al., 2016). Therefore, a teacher needs to be careful in choosing learning media that is appropriate and appropriate to the material being taught.

The findings of this research contribute significantly to the advancement of knowledge and address national educational challenges, particularly in the context of Madrasah Ibtidaiyah. The study demonstrates the effectiveness of pop-up book learning media, validated by material and media experts, and shows a moderate improvement in student learning outcomes. This research supports the shift towards innovative educational media, aligning with contemporary pedagogical theories that emphasize student engagement and active learning, as highlighted in studies on audio-visual media's impact on student motivation and understanding (Yulinar & Shanie, 2023). In addition, it reinforces the need for competency-based assessments in science education, as discussed in the new paradigms of learning assessment (Saleh & Alif Utama, 2024).

The effective use of pop-up books can enhance learning experiences, similar to other interactive media that have shown significant improvements in student engagement and academic performance (Handayani et al., 2023). The findings also advocate for the integration of diverse teaching methods, such as problem-based learning, which have proven effective in improving student outcomes (Otoshi & Eliyasni, 2023). Therefore, future research should expand the application of pop-up book media across various Madrasah Ibtidaiyah to validate its effectiveness in different contexts. Moreover, educators should be trained in utilizing innovative media to foster a more engaging learning environment.

While the study shows promising results, it is essential to consider the limitations of its scope, suggesting that broader implementation and further research are necessary to generalize findings across different educational settings. This research and development is still limited to the scope of the MIN 1 Bener Meriah school; it has not been tested in wider schools. So, it is still possible for this research to continue with the implementation of the use of Pop-Up Book media in science learning at Madrasah Ibdidaiyah.

CONCLUSION

Based on the data above, it can be concluded that the development of pop-up book learning media for science subjects meets the feasibility of being implemented in learning. The validity test on two media experts and material experts obtained results of 4.1 from material experts in the valid category and 4.4 from learning media experts in the very valid category.

Then, based on the effectiveness test using pretest and posttest techniques, the N-Gain test results were obtained at 0.61 with a moderate level of effectiveness, so it can be concluded that the pop-up book learning media for science subjects is effective for use in learning. This research and development is still limited to MIN 1 Bener Meriah, so further research must be implemented in Madrasah Ibtidaiyah.

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