DEVELOPMENT OF LEARNING MEDIA SMART BOOK TO IMPROVE UNDERSTANDING OF ELEMENTARY SCHOOL STUDENTS IN SCIENCE LEARNING

Framz Hardiansyah[1], Zainuddin[2], Tri Sukitman[3], Choli Astutik[4]
[1,2,3,4]STKIP PGRI, Sumenep, Indonesia
[1,2,3,4]Trunojoyo Gedungan Street, Sumenep Regency-East Java
Email: framz@stkippgrisumenep.ac.id[1], zainuddin@stkippgrisumenep.ac.id[2], tri.sukitman@stkippgrisumenep.ac.id[3], cholilabib@stkippgrisumenep.ac.id[4]

Abstract:
This research is motivated by the problems in elementary schools, namely learning media that are not yet varied and the limitations of tools and materials in the learning process. The of this research development to (a) determine the attractiveness of this smart book media in the learning process on animal life cycle material and (b) determine the level of students' understanding after using the smart book media. This research method the Research and Development (R&D) type of ADDIE development model, which has five stages: analyze, design, development, implementation, and evaluation. The research design was a one-group pre-test and post-test design, with before-after experiments. The research was carried out at SDN Baban 1 Sumenep, with 30 fourth-grade students as tested subjects. The instruments used to obtain data were observation, questionnaires and achievement tests of learning outcomes. The results of the development carried out (a) The results of the trial to determine the level of attractiveness of smart book media in fourth-grade students obtained a percentage of 96.8%. (b) The level of students' understanding increasing, as seen from the average pre-test score of 60.3% and the post-test average value of 84.2%; it can be inferred that students effectively used the smart book media. The results of the t-test with a significance level of 0.05 obtained t-count = 5,542 > t-table = 1,699, which means t-count > t-table. These results prove that there were differences in students' understanding before and after using the smart book media for animal life cycle material (metamorphosis).

Abstrak:
Penelitian ini dilatarbelakangi pada masalah yang ditemukan di sekolah dasar yaitu media pembelajaran yang belum bervariatif, serta keterbatasan alat dan bahan dalam proses pembelajaran. Penelitian pengembangan ini bertujuan untuk (a) mengetahui daya tarik media *smart book* ini dalam proses pembelajaran materi daur hidup hewan dan (b) mengetahui tingkat pemahaman siswa setelah menggunakan media *smart book*. Metode penelitian ini menggunakan model pengembangan ADDIE tipe *Research and Development (R&D)*, yang memiliki lima tahapan yaitu analisis, desain, pengembangan, implementasi, dan evaluasi. Desain penelitian ini adalah *one group pre-test post-test design*, dengan sebelum-sesudah eksperimen. Penelitian dilaksanakan di SDN Baban 1 Sumenep dengan subjek uji coba 30 siswa kelas IV. Instrumen yang digunakan untuk memperoleh data menggunakan observasi, angket dan tes ketercapaian hasil belajar. Hasil pengembangan yang dilakukan adalah (a) Hasil uji coba untuk mengetahui tingkat daya tarik media *smart book* pada siswa kelas IV diperoleh persentase sebesar 96,8%. (b) Tingkat pemahaman siswa meningkat, terlihat dari nilai rata-rata *pre-test* 60,3% dan nilai rata-rata *post-test* 84,2%; dapat dikatakan bahwa siswa efektif menggunakan media *smart book*. Hasil uji-t dengan taraf signifikansi 0,05 diperoleh t-hitung = 5,542 > t-tabel = 1,699 yang berarti t-hitung > t-tabel. Hasil tersebut membuktikan bahwa terdapat perbedaan

pemahaman siswa sebelum dan sesudah menggunakan media *smart book* pada materi daur hidup hewan (metamorfosis).

Keywords:
Smart Book, Science Learning, Animal Life Cycle (Metamorphosis)

***How to Cite*:** Hardiansyah, F., Zainuddin, Sukitman, T., & Astutik, C. (2023). Development of Learning Media Smart Book to Improve Understanding of Elementary School Students in Science Learning. *Lentera Pendidikan : Jurnal Ilmu Tarbiyah dan Keguruan,* 26(1), 72-87. https://doi.org/10.24252/lp.2023v26n1i7.

INTRODUCTION

Education is a conscious, planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious, spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation, and state (Hardiansyah, 2022). Education is a place that has an important role in human survival in developing their talents and potential to deal with any changes (Nazaruddin & Efendi, 2018). To make each individual knowledgeable, each individual must be active in learning because learning is a process carried out by individuals to obtain a new change in behavior as a whole as a result of the individual's own experience in interaction with his environment (Pratiwi, 2019). The learning process carried out formally in schools aims to direct changes in behavior and knowledge of students; one of the successful learning processes is dependent on the competence of teachers in teaching (Hardiansyah & Misbahudholam, 2022). Elementary school is an initial educational institution for someone to seek knowledge before continuing to the next level of education . In learning activities, students do not just see and imitate what is observed and taught by the teacher, but must be able to select, filter, give meaning, and be active in the learning process. Characteristics of students at the elementary school level, in general, tend to have a great curiosity about something new that is interesting and a soul that still likes to play (Nugroho & Surjono, 2019).

The learning process will look interesting if the teacher conveys this knowledge in a way that students can understand because the understanding of each student is different, some are quick to catch the material, and some are not (Hardiansyah & Mas'odi, 2022). Teachers must be more creative in understanding any changes in the surrounding environment (Hasanudin, Mayasari, Saddhono, & Prabowo, 2021). They must be able to determine various strategies, methods, and learning media that can involve students actively in the teaching and learning process so that learning activities are more effective. Professional teachers not only need to prepare subject matter but are also required to be creative in using and developing learning media (Putri & Yaswinda, 2022). Learning media will facilitate interaction between teachers and students, and make learning activities more effective and efficient (Asirika & Refnaldi, 2018). The learning media created must be able to arouse the curiosity of students. If the students only listen to verbal information from the teacher, they will not understand the lesson well. Learning

will be more meaningful if students are involved in seeing, touching, or experiencing themselves through learning media (Susilo, Sujadi, & Indriati, 2018).

Based on the results of observations by conducting interviews with fourth-grade teachers at one of the elementary schools in Sumenep Regency, it can be said that the learning media used are not varied and less effective, especially in visual learning media such as pictures, models, objects, charts, graphs, and others. In learning, teachers only rely on learning media already available in schools in the form of package books, pictures, and objects around students. This causes the students' understanding of science content to be low. Textbooks used in learning are less attractive because they only contain a lot of writing and some pictures, so they have a boring and monotonous impression. Textbooks with a display that tends to be less attractive cause a lack of student interest in reading books. The images used as learning media are adequate but not large enough for large-group teaching purposes unless projected through a projector. Teachers teaching use one-way lectures and question and answer; students tend to be passive because students only listen to the teacher's explanation, take notes, and then work on the questions. Students also do not understand the problems that are done at school; this influences the student's motivation to learn.

Based on the results of interviews with the principal, he wanted every teaching and learning activity to be designed as attractive as possible to make students enthusiastic about learning so that students' understanding increased. According to the principal, teachers must be able to keep up with the times, take advantage of technological advances, and design every teaching and learning activity to always attract students' attention and always make students enthusiastic and have a high understanding. The image media used by teachers in schools in thematic learning is still in the form of two-dimensional image media, this media can only be seen from one side, and its size is sometimes limited for learning media. It is not easy to describe or describe the actual form, and the presentation of the material is less attractive, making students not understand the material presented, and learning is not conducive. Meanwhile, in the implementation of thematic learning, students are required to be able to focus, understand the material, develop competence, and feel the benefits and meaning of learning because the material is presented in a concrete or real way.

The learning objectives will be easily achieved through the use of appropriate media and in accordance with learning needs (Nurdin & Sutama, 2020). Many media can be used in teaching and learning, one of which is smart book media (Diyantari, Wiyasa, & Manuaba, 2020). The smart book is practical and easy to carry; the display can be in two, three-dimensional forms that can increase student enthusiasm for learning, and the smart book media can be used independently or in groups (Nazaruddin & Efendi, 2018). Smart book media is a book that has 3-dimensional elements and can move when the page is opened, has a beautiful and enforceable image display, develops students' creativity, and stimulates the imagination (Ramadhani, Amelia, & Mahardika, 2018). Smart book learning media has its charm for students because it can present visualizations with shapes made by folding, moving, and appearing to provide surprises

and admiration for students when opening each page so that it will be easier to enter into memory when using this medium (Rahmawati & Rukiyati, 2018). Smart book media was chosen by considering various reasons, namely: a) this media is more interesting than the previous media, which is only in the form of book media containing text and images. b) smart book media can display three-dimensional elements that provide a concrete picture of the story with illustrations and writings. c) easy use of media for both educators and students. Therefore, efforts are needed to develop Smart book learning media to foster students' understanding of science learning (Widhiastuti, 2020).

Science is a knowledge in which it studies events that occur in nature in the form of facts, concepts or principles, procedures, and legality. Science is one of the fields of knowledge that has a very broad scope of material (Elmunsyah, Hidayat, & Asfani, 2019). The scope of the material includes biotic and abiotic (Putri & Yaswinda, 2022). The scope of biotic material includes animals, humans, plants, and microorganisms (Pratiwi, Sugito, & Subandowo, 2020). While the scope of abiotic material includes energy and the solar system (Permana & Sari, 2018). One of the science materials in the biotic material is about animals (Afandi, Yustiana, & Kesuma, 2021). The animal life cycle (metamorphosis) is one of the materials that students need to understand at the elementary school level to know the metamorphosis process in animals (Sari & Suryana, 2019). In addition, students are expected to be able to identify animals that undergo complete metamorphosis and incomplete metamorphosis (Hardiansyah & Zainuddin, 2022). Understanding and mastery of science concepts can be obtained through direct learning experiences. In providing hands-on learning experiences, students are facilitated to develop several process skills and scientific attitudes in obtaining scientific knowledge about themselves and the natural environment (Elfiani, Taufik, & Baiduri, 2019).

Previous research has been carried out by (Permana & Sari, 2018) with the title Media Development Smart book Theme Events for class III SD/MI. This study uses development research methods and results in developing Pop Up Book learning media in the event theme lesson. Those who fall into the very good criteria with research results from media experts that show a 100% feasibility percentage, material experts get a percentage of 71.5%, and student assessments get a percentage of 75.2%, so the Pop Up learning media is valid and feasible to use.. Furthermore, research was found by (Warnaby & Shi, 2018) entitled Development of Smart book Learning Media in Science Subjects Class III Elementary School. The journal states that learning using Smart book media is feasible and can be used to improve student achievement with an average percentage of 81.81%. Furthermore, research conducted by (Deliyannis & Kaimara, 2019) Development of Smart book Learning Media in Natural Science Subjects Class III SDN 3 Junjung, Sumbergempol District, Tulungagung Regency. The Smart book media that was developed effectively improve students' cognitive learning outcomes in chemistry learning, as indicated by the difference in the average pretest and post-test data analyzed by T-test of 9.72 and an average increase of 0.44 category. Therefore, one learning media was tested in this study, namely the smart book media. With the smart book media, it is hoped that students can stimulate their imagination to understand the

subject matter and improve student learning outcomes. In addition, the learning process with smart book media will be much more fun because the media can increase students' interest and attention in the science learning process, especially the animal life cycle material (metamorphosis).

RESEARCH METHOD

The method used in this research the Research and Development method. The research and development method is a method used to produce specific products and to test the effectiveness of these products (Hardiansyah, Misbahudholam, & Hidayatillah, 2022). Research and development aim to produce new products through several development processes; products produced in Research and Development (R&D) can be in the form of media, modules, books, evaluation tools, and learning tools (Elfiani, Taufik, & Baiduri, 2019). The research was conducted to create a learning media product as a pop-up book material for the animal life cycle (metamorphosis) in class IV SDN Baban 1 Sumenep. This research and development procedure uses the ADDIE development model. The selection of the ADDIE model is based on the consideration that the ADDIE model is easy for researchers to understand. The ADDIE model is arranged systematically to solve learning problems related to learning media that suit the needs and characteristics of students. The ADDIE model is one of the systematic learning design models that is arranged programmatically with sequences of activities to solve learning problems related to learning resources that suit the needs and characteristics of students (Hardiansyah & Mulyadi, 2022). Systematically it includes the overall design of the learning process, including (a) Analyzing; at this stage, the researcher hat problems behind the emergence of learning media development. (b) Design; at this stage, the researcher he things studied. The researchers he necessary plans. Researchers references related to the development of the media, namely the pop-up book media. (c) Development; At this stage, the media developed by the researcher according to a predetermined design, then the media that has been made will be validated by material experts and media experts. The selection of a media expert is someone with expertise in instructional media, in this case, a lecturer. The selection of material experts is practitioners/teachers who teach natural science subjects. (d) Implementation; at this stage, the media developed implemented in real situations, namely in the classroom. During implementation, the media that has been developed applied to the actual conditions. The material presented by the media developed. (e) Evaluation; by looking at the results of feedback from students after using the pop-up book media.

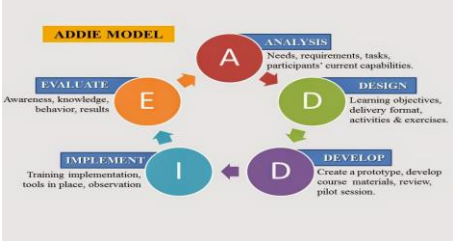

Figure 1. Addie Model Stages

The trial design used in this development research student test results when using the media and when not using this pop-up book. The trial design was used to determine the attractiveness of the learning media developed by the researcher. The product developed by the researcher was tested on the fourth-grade students of SDN Baban 1 Sumenep, totalling 30 students. The researchers used instruments such as observations, questionnaires, and learning outcomes tests to collect data in this study. And then, the researchers observed learning activities in fourth-grade students at SDN Baban 1 Sumenep. The questionnaires addressed to the test subjects, namely students, to determine the level of attractiveness of the media through field trials. The students only the answer criteria that match what they feel. The learning outcomes test used to determine the level of student understanding by measuring initial achievement before treatment and final achievement after thetreatment. This treatment showed increased students' understanding after using the pop-up book media for animal life cycles (metamorphosis).

Table 1. Material Expert Assessment Results

No	Statement	Score	Max. Score	P %	information
1	Suitability of indicators with core competencies, basic competencies in the development of learning media	4	5	80	Valid
2	Conformity of the material presented with basic competencies and indicators achieved	5	5	100	Very Valid
3	Learning media adds to students' understanding of animal life cycle material (metamorphosis)	5	5	100	Very Valid
4	Presentation of material in smart book media is easy for students to understand	5	5	100	Very Valid
5	Confused presentation of the material	5	5	100	Very Valid
6	The suitability of the language used in the learning media	4	5	80	Valid
7	The smart book learning media component is sufficient	4	5	80	Valid
8	Accuracy of evaluation to measure student understanding	4	5	80	Valid
	amount	36	40	90%	Very Valid

Table 2. Media Expert Assessment Results

No	Statement	Score	Max. Score	P %	information
1	The attractiveness of the cover design	3	5	60	decent enough
2	The suitability of the cover design with the teaching materials	3	5	60	decent enough
3	Appropriateness of the size of the letters used for fourth-grade students	3	5	60	decent enough
4	The suitability of the typeface used for fourth-grade students	3	5	60	decent enough
5	The suitability of the images used with the material presented	3	5	60	decent enough
6	The images presented can clarify the material	4	5	80	worthy
7	The attractiveness of media design	4	5	80	worthy
8	Suitability of smart book media with the characteristics of elementary school students	4	5	80	worthy
	amount	27	40	67,5	decent enough

Data analysis in this study used quantitative analysis. Data analysis of test results conducted to measure the level of understanding of students in a limited trial in the field was carried out using experiments comparing the results before and after using a one-group experimental design with pre-test and post-test (one group pre-test - post test design) because this design an initial test before treatment.

O_1	X	O_2

Figure 2. one grup pre-test – post-test design

To analyze quantitative data in the form of smart book questionnaire validation results as well as pre-test and post-test results using a Likert scale with five-level criteria, then analyzed by calculating the percentage of item scores in each answer to each question in the questionnaire and observation sheet.

Table 3. Student Questionnaire Criteria

Question	Criteria				
	Strongly disagree	disagree	Quite	agree	strongly agree
Smart book media can give me motivation to study					

hard	
The language used in the Smart book is easy for me to understand	
The pictures in the Smart book are interesting	
I can understand the subject matter using Smart book	
I'm getting more active in learning science	
I like to use Smart book media	
I find it easy to do the tasks in the Smart book media	
Smart book media display makes it easier for me to learn	
I feel happy while carrying out learning using Smart book media	

The analysis technique used to determine the mean (average) of the pretest and posttest with the following mean formula:

$$\text{Mean}=\frac{\sum x}{N}$$

Based on the results of the analysis using the mean (average) pre-test and post-test, and to strengthen the data, used t-test analysis (t-test). The data analysis technique uses the dependent sample test or paired sample t-test. Paired sample t-test is a type of statistical test that aims to compare the averages of two groups paired with each other. Paired samples can be interpreted as samples with the same subject but experiencing two different treatments, namely measurements before and after being given treatment. The t-test formula used for paired samples is as follows:

$$t=\frac{D}{\sqrt{\frac{d^2}{N(N-1)}}}$$

To find out the difference before and after using instructional media, the test results compared with a t_{table} with a significant level of 0.05 or 5% with the following hypothesis:

H_0: There no significant difference (5%) between before and after using learning media.

H_1: There a significant difference (5%) between before and after using learning media.

Decision-making:

a) If $t_{count} > t_{table}$, then the is result is significant, which means H_1 accepted.

b) If $t_{count} < t_{table}$, then the is result is insignificant, which means H_1 rejected.

RESULTS AND DISCUSSION

Analyze Stage

Analysis of the curriculum applied at SDN Baban 1 Sumenep is the 2013 curriculum. The achievements to be achieved by students are seen in the core competencies and basic competencies that are then translated into indicators and learning objectives.

Table 4. Basic competencies and indicators

Basic competencies	Indicators
3.2 Describe the life cycle of various types of living things	3.2.1 Give examples of animals that undergo complete and imperfect metamorphosis 3.2.2 Describe the process of metamorphosis of some animals 3.2.3 Sequence the stages of the process of metamorphosis of some animals

In its achievement, the teacher has not used learning media that supports animal life cycles (metamorphosis); the teacher only uses the 2013 curriculum package book. Based on the observations made in the classroom, the teacher explains, just glued to the textbook. The learning process uses the lecture method, where learning is centered on the teacher, causing students to feel bored; some even talk alone with friends at their desks. Based on observations made by researchers, it can be concluded that SDN Baban 1 Sumenep requires learning media that can attract students to learn and make it easier for students to understand learning materials.

Design Stage

At the design stage, two things are carried out: the selection of software (software) and the choice of tools and materials to be used. Software/software is used in designing smart book products, namely CorelDraw X5 and Adobe Photoshop CS3. The materials involved in the media are life development schemes of frogs, butterflies, mosquitoes, grasshoppers, cockroaches, and dragon flies. The material that has been prepared leads to indicators in class IV thematic books semester two theme six sub-themes 2. So that the material provided remains by standards and does not deviate so; that the purpose of making smart book media is to support students in understanding the material provided. The design of the resulting media is in the form of a smart book according to the needs of grade IV students. The first step in making media design is to create a storyline arranged in a storyboard to make it easier to make smart book media. The tools and materials used in media development are relatively easy to find in everyday life, such as scissors, cutters, rulers, welkro, double-sided tape, double-sided foam tape, art paper, and yellow cardboard.

Development Stage

The product developed is in the form of a smart book of animal life cycles (metamorphosis) for fourth-grade students. This learning media consists of 4 stages: (a) pre-introduction; this section includes cover, preface, table of contents, core competencies, essential competencies, and indicators. (b) the introduction contains the title of the material to be taught. The title of the material is included to know the discussion material to be studied. (c) the content section, covering the material to be taught. (d) the evaluation section contains practice questions related to animal life cycle material (metamorphosis) which is intended to measure students' understanding of the material that has been studied. Smart Book media was developed with front and back covers, prefaces, table of contents, core competencies, basic competencies, indicators, learning objectives, instructions for using smart Books, content/material equipped with attractive and embossed pictures, and practice questions. After the Smart Book Media has been developed, the next step is to test the validity of the Smart Book media on the Animal Life Cycle material being produced. Subject content experts carried out the validity test of the smart book media, learning media experts, learning design experts, practitioner experts, and individual trials. The results of the validity of the Animal Life Cycle-Smart Book learning media were obtained from expert reviews and personal problems. The validation results obtained that the smart book learning media in science subjects (Animal Life Cycle) obtained excellent qualifications according to the five-scale conversion reference with a percentage range of 90% - 100%.

Implementation Stage

The product development was tested on all the fourth-grade students of SDN Baban 1 Sumenep, as many as 30 students.

Table 5. Field Evaluation

Question	Score	Max Score	P (%)	Criteria
Smart book media can give me motivation to study hard	145	150	96,7	Very Interesting
The language used in the Smart book is easy for me to understand	147	150	98	Very Interesting
The pictures in the Smart book are interesting	144	150	96	Very Interesting
I can understand the subject matter using Smart book	146	150	97,3	Very Interesting
I'm getting more active in learning science	142	150	94,7	Very Interesting
I like to use Smart book media	144	150	96	Very Interesting
I find it easy to do the tasks in the Smart book media	147	150	98	Very Interesting
Smart book media display makes it easier for me to learn	147	150	98	Very Interesting
I feel happy while carrying out	146	150	97,3	Very

learning using Smart book media				Interesting
Total	1308	1350	96,8%	Very Interesting

Based on the field evaluation of the smart book media as listed in table 2, it can be calculated the percentage level of achievement of the smart book media attractiveness using the following percentage formula:

$$P=\frac{\text{Score}}{\text{Max Score}} \text{ x } 100\%$$

The calculations using the above formula obtained the percentage level of achievement of 96.8%, which means that it is a very valid criterion, so the developed smart book media does not need revision. Criticisms and suggestions from respondents' on-field evaluation in open-ended questions are used as consideration for improving this smart book media.

Table 6. Pre-test and post-test scores

	Pre-test	Post-test
Total	1810	2527
Mean	60,3	84,2

Based on the calculation using the mean formula above, the average pre-test score is 60.3, and the post-test average is 84.2. shows that the post-test score is better than the pre-test score. That is, there are differences in students' understanding of this smart book media use. The pre-test and post-test value data were then analyzed through a t-test with a significance level of 0.05. This analytical technique is used to prove the significance of differences using the developed smart book media with teaching materials commonly used in schools.

Table 7. The results of the Pre-test and Post-test field evaluations with the t-test formula

	Pre-test	Post-test	(X2-X1)	d^2
Total	1810	2527	717	16177

Based on the results of the pre-test and post-test that have been obtained, then a t-test is carried out using the t-test formula. To get the Different (D) value, the calculation was carried out using the following t-test formula:

a. $D=\frac{\sum(x2\text{-}x1)}{N}=\frac{717}{30}=23,9$

b. $t=\frac{D}{\sqrt{\frac{d^2}{N(N-1)}}}$

$=\frac{23,9}{\sqrt{\frac{16177}{30(30-1)}}}$

$=\frac{23,9}{4,312}=5,542$

From the results of calculations that have been carried out using the t-test formula described above, it is obtained that the t_{count} is 5.542, Furthermore, in testing the hypothesis, it is determined by the following steps,

a. If the value of t_{count} is smaller than t_{table}, then the result is non-significant, meaning that H_1 is rejected and H_0 is accepted.
b. If the value of t_{count} is greater than t_{table}, then the result is significant, meaning that H_1 is accepted and H_0 is rejected.
c. Determining the level of significance and degrees of freedom
   dk = N – 1
      = 30 – 1
      = 29

With a significant degree (α) = 0.05 , So t_{table} is 1,699. Results obtained $t_{count} > t_{tabel}$ then the results are significant, namely, H_1 was accepted and H_0 was rejected.

a. H_0 = There is no difference in the level of understanding between before and after using the smart book media. (Rejected)
b. H_1 = There is a difference in the level of understanding between before and after using the smart book media. (accepted)

The results of the t-test that has been carried out show differences in the average scores of students before and after using the developed product. Shows that the use of the given smart book media can improve the understanding of students.

Discussion

Learning is a communication process that involves teachers and students with learning materials as messages to be conveyed with an orientation towards achieving an educational goal (Putri & Yaswinda, 2022). The position of the media in learning is an intermediary so that messages in learning can be conveyed to students effectively and efficiently (Serevina, Astra, & Sari, 2018). Learning can take place with optimal use of media and achieve optimal results. The selection of the right learning media will make the media effective if applied. The selected learning media should be able to be harmonized according to students' abilities and needs in exploring the material's content. Teachers must be able to use all learning media. The value and benefits of learning media are largely determined by how the skills of teachers use learning media. The skills of using this learning media can later be passed on to students so that students are also able to skillfully use the selected learning media (Sari & Suryana, 2019).

The development of smart book learning media is based on the fact that there are no learning media that has learning specifications on animal life cycle material (metamorphosis). In thematic books, there is little material about the life cycle of animals (metamorphosis). This smart book broadly contains material about the animal life cycle (metamorphosis). The smart book development product is packaged in a book printed on A4 size paper made of 210 grams of art paper for the contents of the book and 310 grams of A4 art paper for the book cover with the aim that the developed smart book is attractive and durable. The product for developing the smart book media for animal life cycle (metamorphosis) material has been gradually refined through an assessment or validation from expert smart book media developers. Content/material experts carried out the validation for the animal life cycle (metamorphosis) and media design experts, as well as assessments from practitioners, namely the fourth-grade teacher at SDN Baban 1

Sumenep, and the results of field trials.

Based on the results of the practitioner's assessment, namely the fourth-grade teacher at SDN Baban 1 Sumenep, the percentage result was 98%, and the percentage of achievement was in the valid qualifications or suitable for use. In the opinion of practitioners, learning media is feasible because the material presented is by the 2013 curriculum, Core Competencies, Basic Competencies, and indicators. Likewise, according to practitioners, the existing evaluation instruments are by the material presented so that students will have no difficulty understanding the meaning of the existing evaluation questions. The teacher's role is as a facilitator, not as a provider of information that creates a conducive student environment. After conducting a trial by explaining the material using this smart book, at the end of the lesson, the researcher gave a questionnaire to be answered by the students according to the indicators in the questionnaire. The results of giving smart book media questionnaires by fourth-grade students of SDN Baban 1 Sumenep as test subjects showed that the media developed had an attractiveness percentage of 96.8%. Shows that the development of smart book media material for animal life cycles (metamorphosis) is very interesting because it is by the characteristics of elementary school students.

The average result of the fourth-grade students' pre-test scores scored 60.3, while the fourth-grade students' average post-test scores scored 84.2. proves a difference in the average results of the pre-test and post-test of fourth-grade students before and after using learning media. Proving that the use of smart book media affects student learning outcomes. The use of media in learning adapted to students' conditions and characteristics can affect the improvement of student learning outcomes (Nazaruddin & Efendi, 2018). Effective learning will occur if the necessary learning materials are available (Mariantini, Wibawa, & Suarjana, 2022). Several things affect the understanding and learning outcomes of fourth-grade students before and after using this smart book media, one of which is the media developed that is attractive to students so that it can affect student learning outcomes. The use of color in the smart book media gives a certain meaning or aesthetics that can generate student interest so that students become motivated to learn. A learning process that uses interesting media can improve students' understanding and learning outcomes because if the media is interesting, it will make them more enthusiastic about learning and not get bored. Teachers choose media in classroom activities, one of which is that the media they choose can attract students' interest and attention and lead them to a more structured and organized presentation (Kolivand, Prakash, & Lopez, 2021).

The development of interesting media will influence students and increase their enthusiasm for learning, affecting student understanding (Mingsiritham & Chanyawudhiwan, 2017). The use of media in learning adapted to students' conditions and characteristics can affect the improvement of student learning outcomes (Hardiansyah, 2022). Effective learning will occur if the necessary learning materials are available. Good learning media has several criteria, including 1) Accuracy with learning objectives, meaning that learning media are selected based on predetermined goals. The

learning objectives in the smart book learning media have been determined from the indicators developed. 2) Support for the content of the subject matter, meaning that learning materials that are facts, principles, concepts, and generalizations need media assistance to be easily understood by students. 3) The teacher's skills in using it. Whatever type of media is needed, the main requirement is that the teacher can use it in the teaching process. Smart book learning media is very easy to use by teachers students. Students can directly read while studying the material (Audia, Yatri, & Mawani, 2021).

CONCLUSION

The smart book learning media for animal life cycle material (metamorphosis) has a very interesting level of interest. This level of attractiveness was obtained from the results of student responses to the attractiveness of the smart book learning media for animal life cycles (metamorphosis) by fourth-grade students at SDN Baban 1 Sumenep. The attractiveness can be seen from the attractive cover of the book, the language used is simple so that students easily understand the material, the images that can clarify the material, and the size and type of letters used are clear to read and interesting so that they can motivate students to be more enthusiastic in learning. The smart book learning media for animal life cycle material (metamorphosis) can improve student learning outcomes marked by an increase in students' understanding of metamorphosis material. Evidenced by the increase in student learning outcomes based on the fourth-grade field test, which is measured using a learning achievement test.

REFERENCES

Afandi, M., Yustiana, S., & Kesuma, N. P. (2021). The Development of Pop-Up Book Learning Media in Pancasila Materials Based on Local Wisdom at Elementary School. *ELEMENTARY: Islamic Teacher Journal*, *9*(1), 57. https://doi.org/10.21043/elementary.v9i1.10001.

Asirika, D., & Refnaldi, R. (2018). Teaching Writing Narrative Texts by Using the Pictures of Pop-Up Book as a Media to Jurior High School Students. *Journal of English Language Teaching*, *6*(1), 242–251. https://doi.org/10.24036/jelt.v6i1.9691.

Audia, C., Yatri, I., & Mawani, S. (2021). Development of Smart Card Media for Elementary Students. *Journal of Physics: Conference Series*, *1783*(1), 12114. https://doi.org/10.1088/1742-6596/1783/1/012114.

Deliyannis, I., & Kaimara, P. (2019). Developing smart learning environments using gamification techniques and video game technologies. In *Didactics of smart pedagogy* (pp. 285–307). Springer. https://doi.org/10.1007/978-3-030-01551-0_15.

Diyantari, I. A. K. D., Wiyasa, I. K. N., & Manuaba, I. B. S. (2020). Model Snowball Throwing Berbantuan Media Pop Up Book Berpengaruh Terhadap Kompetensi Pengetahuan Ipa. *Jurnal Ilmiah Pendidikan Profesi Guru*, *3*(1), 9–21. https://doi.org/10.23887/jippg.v3i1.26973.

Elfiani, L., Taufik, M., & Baiduri, B. (2019). The Development of Audio-Based Pop-Up Book Media on Two-Dimensional Rectangular For Junior High School Students. *MEJ*

(Mathematics Education Journal), *3*(1), 44–54. https://doi.org/10.22219/mej.v3i1.8420.

Elmunsyah, H., Hidayat, W. N., & Asfani, K. (2019). Interactive learning media innovation: utilization of augmented reality and pop-up book to improve user's learning autonomy. *Journal of Physics: Conference Series*, *1193*(1), 12031. https://doi.org/10.1088/1742-6596/1193/1/012031.

Hardiansyah, F. (2022). Snowball Throwing: A Method To Uplift Elementary School Students' Responsibility on Environment. *AL-ISHLAH: Jurnal Pendidikan*, *14*(3), 3853–3864. https://doi.org/10.35445/alishlah.v14i3.1966.

Hardiansyah, F., & AR, M. M. (2022). Enhancing Students' Learning Motivation through Changing Seats in Primary School. *Mimbar Sekolah Dasar*, *9*(1), 253–268. https://doi.org/10.53400/mimbar-sd.v9i1.43002.

Hardiansyah, F., & Mas'odi, M. (2022). The Implementation Of Democratic Character Education Through Learning Of Social Science Materials Of Ethical And Cultural Diversity In Elementary School. *Journal of Innovation in Educational and Cultural Research*, *3*(2), 234–241. https://doi.org/10.46843/jiecr.v3i2.101.

Hardiansyah, F., Muhammad Misbahudholam, A. R., & Hidayatillah, Y. (2022). IPAS Learning Assessment To Measure Science Process Skill In Elementary School. *International Journal of Elementary Education*, *6*(4), 612–623. https://doi.org/10.23887/ijee.v6i4.54217.

Hardiansyah, F., & Mulyadi. (2022). Improve Science Learning Outcomes for Elementary School Students Through The Development of Flipbook Media . *Jurnal Penelitian Pendidikan IPA*, *8*(6 SE-Articles "Regular Issue"), 3069–3077. https://doi.org/10.29303/jppipa.v8i6.2413.

Hardiansyah, F., & Zainuddin, Z. (2022). The Influence of Principal's Motivation, Communication, and Parental Participation on Elementary School Teachers' Performance. *Al Ibtida: Jurnal Pendidikan Guru MI*, *9*(2), 319. https://doi.org/10.24235/al.ibtida.snj.v9i2.9936.

Hasanudin, C., Mayasari, N., Saddhono, K., & Prabowo, R. A. (2021). IbisPaint X Apps in Creating Collaborative 3D Learning media of Pop-Up and Movable Books. *Journal of Physics: Conference Series*, *1764*(1), 12131. https://doi.org/10.1088/1742-6596/1764/1/012131.

Kolivand, H., Prakash, E. C., López, M. C., Hernández, D., & Navarro-Newball, A. A. (2021). Reimaging the book... again! a new framework for smart books using digital twins technology. *Ibero-American Congress of Smart Cities*, 233–245. https://doi.org/10.1007/978-3-030-69136-3_16.

Mariantini, L., Wibawa, I. M. C., & Suarjana, I. M. (2022). Smart Book Media in Improving Learning Outcomes of Basic Skills of Grade I Elementary School Students. *MIMBAR PGSD Undiksha*, *10*(3). https://doi.org/10.23887/jjpgsd.v10i3.49510.

Mingsiritham, K., & Chanyawudhiwan, G. (2017). A Development of Smart Book to Assist Communication for Hearing Impaired Students. *Veridian E-Journal, Silpakorn University (Humanities, Social Sciences and Arts)*, *10*(5), 98–116. https://he02.tci-thaijo.org/index.php/Veridian-E-Journal/article/view/102573/0.

Nazaruddin, M. A., & Efendi, M. (2018). The book of pop up augmented reality to increase focus and object recognition capabilities for children with autism. *Journal of ICSAR*, *2*(1), 9–14. https://doi.org/10.17977/um005v2i12018p009.

Nugroho, T. A. T., & Surjono, H. D. (2019). The effectiveness of mobile-based interactive

learning multimedia in science process skills. *Journal of Physics: Conference Series*, *1157*(2), 22024. https://doi.org/10.1088/1742-6596/1157/2/022024.

Nurdin, I., & Sutama, S. (2020). Implications Of Tolerance Character Values In Home-Stay Activities: A Multicultural Education Perspective In Assalaam Senior High School. *Profetika: Jurnal Studi Islam*, *21*(2), 113–124. https://doi.org/10.23917/profetika.v21i2.13073.

Permana, E. P., & Sari, Y. E. P. (2018). Development of pop up book media material distinguishing characteristics of healthy and unfit environments class III students elementary school. *International Journal of Elementary Education*, *2*(1). https://doi.org/10.23887/ijee.v1i1.13127.

Pratiwi, I. (2019). *The Effect Of Applying Collaborative Strategy Reading (Csr) To The Students' Reading Comprehension Assisted By Pop Up Book Story*. Universitas Muhammadiyah Sumatera Utara.

Pratiwi, K. B., Sugito, S., & Subandowo, M. (2020). The Development Pop-Up Books To Improve Children's Language Skills. *JKTP: Jurnal Kajian Teknologi Pendidikan*, *3*(4), 408–414. https://doi.org/10.17977/um038v3i42020p408.

Putri, V. M., & Yaswinda, Y. (2022). Developing Scientific Based Pop Up Media for Children Speaking Skill Development. *6th International Conference of Early Childhood Education (ICECE-6 2021)*, 260–265. https://doi.org/10.2991/assehr.k.220602.053.

Rahmawati, D. I., & Rukiyati, R. (2018). Developing Pop-Up Book Learning Media to Improve Cognitive Ability of Children Aged 4-5 Years. *4th International Conference on Early Childhood Education. Semarang Early Childhood Research and Education Talks (SECRET 2018)*, 60–69. https://doi.org/10.2991/secret-18.2018.10.

Ramadhani, S. P., Amelia, W., & Mahardika, R. (2018). Development of Indonesian cultural environment education books to increase reading students elementary school (interactive pop-up book Betawi culture). *Int. J. Innov. Sci. Res. Techonology*, *3*(7). https://ijisrt.com/development-of-indonesian-cultural-environment-education-books-to-increase-reading-students-elementary-school-interactive-pop-up-book-betawi-culture.

Sari, N. E., & Suryana, D. (2019). Thematic Pop-Up Book as a Learning Media for Early Childhood Language Development. *Jurnal Pendidikan Usia Dini*, *13*(1), 43–57. https://doi.org/10.21009/10.21009/JPUD.131.04.

Serevina, V., Astra, I., & Sari, I. J. (2018). Development of E-Module Based on Problem Based Learning (PBL) on Heat and Temperature to Improve Student's Science Process Skill. *Turkish Online Journal of Educational Technology-TOJET*, *17*(3), 26–36. https://eric.ed.gov/?id=EJ1184205.

Susilo, T., Sujadi, I., & Indriati, D. (2018). Developing A Media 'Visual Design of Pop Up Mathematics Book'as a Supporting Tool in Inquiry-Based Learning for Learning Three-Dimensional Figures. *Journal of Physics: Conference Series*, *1108*(1), 12029. https://doi.org/10.1088/1742-6596/1108/1/012029.

Warnaby, G., & Shi, C. (2018). *Pop-up retailing: Managerial and strategic perspectives*. Springer.

Widhiastuti, R. (2020). Pop Up Book Design as an Introduction Media About Profession for Early Children. *Arty: Jurnal Seni Rupa*, *9*(1), 70–80. https://journal.unnes.ac.id/sju/index.php/arty/article/view/40482.