Development of Vertebrates Diversity Booklet at Siantar Zoo as a Learning Resource on Biodiversity Topic

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Abstrak

Keterbatasan sumber belajar dapat menyebabkan pengalaman belajar yang kurang optimal, yang pada akhirnya berdampak negatif pada hasil pembelajaran. Oleh karena itu, diperlukan penelitian terkait pengembangan buku sebagai sumber belajar yang mendukung guru dalam mengajar dan membantu siswa memahami materi dengan lebih baik. Penelitian ini bertujuan untuk membuat buku tentang keanekaragaman vertebrata di Kebun Binatang Siantar sebagai sumber belajar bagi siswa kelas X di SMA N 1 Pematangsiantar yang sedang mempelajari topik keanekaragaman hayati. Penelitian ini menggunakan metode Research and Development (R&D) yang diadaptasi dari model 4D (Define, Design, Development, dan Disseminate). Untuk memperoleh kelayakan, kepraktisan dan keefektifan booklet, dilakukan uji validitas berdasarkan ahli materi dan ahli media, dilanjutkan dengan uji kepraktisan melalui respon guru serta siswa, kemudian uji keefektifan yang dianalisis dengan uji T desain eksperimen dan N-Gain. Booklet telah dinilai sangat layak oleh ahli materi 88 persen dan ahli media 87,5%, dan dinilai sangat praktis oleh guru 95,21% dan siswa 94%. Untuk uji efektivitas, didapatkan hasil uji t dengan signifikansi 0,000 < 0,05, yang menunjukkan terdapat perbedaan hasil belajar antara kelas eksperimen dan kelas control. Uji N-Gain menunjukkan skor rata-rata N-Gain sebesar 0,625 dan termasuk dalam kategori sedang, yang menunjukkan bahwa booklet keanekaragaman vertebrata di Kebun Binatang Siantar terbukti cukup efektif sebagai sumber belajar.

Kata kunci*—4D Model, Keanekaragamn Hayati, Booklet, Kelayakan*

Abstract

Limited learning resources can lead to less than optimal learning experiences, which ultimately have a negative impact on learning outcomes. Therefore, research is needed related to the development of books as learning resources that support teachers in teaching and help students understand the material better. This study aims to create a book on vertebrate diversity at the Siantar Zoo as a learning resource for grade X students at SMA N 1 Pematangsiantar who are studying the topic of biodiversity. This

study uses the Research and Development (R&D) method adapted from the 4D model (Define, Design, Development, and Disseminate). To obtain the feasibility, practicality and effectiveness of the booklet, a validity test was conducted based on material experts and media experts, followed by a practicality test through teacher and student responses, then an effectiveness test analyzed by the experimental design T test and N-Gain. The booklet has been assessed as very feasible by 88 percent of material experts and 87.5 percent of media experts, and assessed as very practical by 95.21 percent of teachers and 94% of students. For the effectiveness test, the results of the t-test were obtained with a significance of 0.000 <0.05, which showed that there was a difference in learning outcomes between the experimental class and the control class. The N-Gain test showed an average N-Gain score of 0.625 and was included in the moderate category, indicating that the vertebrate diversity booklet at the Siantar Zoo was proven to be quite effective as a learning resource.

Keywords—*4D Model, Biodiversity, Booklet, Feasibility*

1. INTRODUCTION

Kurikulum Merdeka provides more freedom to schools in designing curricula in line with what students need and the potential that students have, so that they have more opportunities to express their needs and potential. So that students will also have more opportunities to expose their needs and potential (Qolbiyah et al. 2022). By allowing students to choose projects that are in keeping with their interests and abilities, Kurikulum Merdeka also gives them the chance to boost their motivation; enhance students' freedom and responsibility by giving them the chance to plan, execute, and assess their projects; maximize their creativity and invention by giving them the chance to investigate a variety of learning resources and produce environmentally responsible goods or solutions; enhance students' ability to think critically and solve problems by giving them chances to recognize issues, gather information, examine facts, and formulate arguments; increase students' capacity for cooperation and communication by giving them chances to collaborate, talk, exchange ideas, and offer feedback (Qolbiyah et al. 2022). In line with this, learning resources are one of the indispensable aspects to support the achievement of learning aims in the implementation of Kurikulum Merdeka.

Based on an interview with a Biology teacher of SMA N 1 Pematangsiantar, one of the problems when learning, especially in the topic of Biodiversity, is the learning resource that still focuses to textbooks. Textbooks also generally only describe brief theories and lack when explaining examples of biodiversity, especially animals, so that students' understanding and learning experience are less than optimal. In addition, there are no direct observations for biodiversity observations, especially animals, which are carried out due to various time, cost and school permits. The student questionnaire's results also demonstrated that students required learning materials because, at the time, the only available learning resources for understanding biodiversity material were textbooks, particularly when it came to the subject of biodiversity levels that were deemed challenging. In order to optimize the benefits of a zoo visit and biodiversity education, instructional resources that support students' understanding of the topic are needed.

Siantar Zoo is one of the local potentials in the Siantar area which is also one of the means of nature protection and preservation that is used for the development of science and technology and for healthy natural recreation facilities. Siantar Zoo is one of the zoos with the most complete variety of animals in Indonesia, especially vertebrates which are very suitable to be used as a source of learning on biodiversity material. In this case, there are many types of animals ranging from pisces, reptiles, aves, and even mammals that can be a source of learning on the subtopic of biodiversity level. The existence of the Zoo as an educational tourism area that is cheap and easy to achieve. In addition, the natural atmosphere in the zoo can initially invite schools to conduct learning and educational tourism trips. The diversity at Siantar Zoo can be contained in the form of a booklet as one of the learning resources that can be used anywhere and anytime, both in the classroom learning or direct observation to Siantar Zoo. With the use of booklets as well as visits to Siantar Zoo, it will be able to increase the understanding of concepts in biodiversity materials and interesting and enjoyable learning experiences (Abdullah, 2010).

Learning resources come in a variety of forms. The Association of Education Communication Technology, or AECT, divides them into six categories: messages, people, materials, devices, procedures, and settings (Rohani & Ahmadi, 1991). Furthermore, educational materials can be broadly categorized as follows: print learning resources, nonprint learning resources, facilities-based learning resources, activity-based learning resources, and surrounding learning resources (Prastowo, 2018). When compared to other learning resources, print learning resources are highly advantageous because they can be used anytime and anywhere, are portable and do not require internet access, and facilitate independent learning by making the material easier for students to understand. One of the resources for learning how to print is a booklet. Because they are designed like books and can be studied independently by students, print materials like booklets have the advantage of being studied at any time. Additionally, because they contain more messages or information than posters, students are more likely to be interested in reading booklets with attractive designs (Gemilang & Christiana, 2016).

Learning resource in the form of booklets generated in this study are projected to give benefits such as more concrete learning experiences, expanded horizons, correct information, and stimulation of critical thinking, as well as improved learning outcomes. The goal of this work is to create a vertebrate diversity booklet at Siantar Zoo as a learning resource for biodiversity theme grade X.

2. RESEARCH METHODS

2.1 *Research Time and Location*

This research carried out from October 2023 to May 2024. This research carried out at Siantar Zoo, Jl. Simanuk-manuk Number 2, Pematangsiantar city and SMAN 1 Pematangsiantar, Jl. Parsoburan Number 24, Pematangsiantar city.

2.2 *Research Stages*

1. Define stage
   At define stage, researchers analyze the aspects that form the basis for designing and developing the product, starting from problem analysis, needs analysis, curriculum analysis, and learning aims analysis.
2. Design stage
   At design stage, product design is carried out from the results of the define stage, including preparation of materials, format selection, preparation of research instruments, and initial drafting.
3. Develop stage
   The develop stage begins with validation by lecturers from material experts and media experts followed by asking for responses from biology teachers and students.
4. Disseminate stage
   The disseminate stage is the implementation of the booklet as a learning resource for students in the experimental class. In addition, it is also seen how effective the booklet is through a comparison of learning outcomes in the control and experimental classes.

2.3 Research Procedures

This research consists of four stages, namely define stage, design stage, development stage, and disseminate stage (Figure 1).

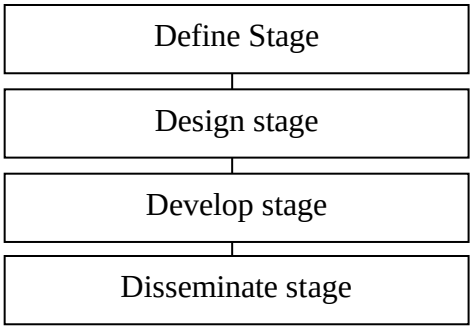

Figure 1. Flow Chart Research Stage (Thiagarajan, 1974)

2.2.1 Define Stage

a. Procedure for Reasearch Activities
   1) Problem analysis
   2) Need analysis
   3) Curriculum analysis
   4) Learning aims analysis
b. Data Collection Techniques
   In the define stage, data collection is carried out by:
   1) Teacher Interview

The interview was conducted directly with Biology teachers by asking 11 questions related to learning activities, learning difficulties, availability of learning resources, student learning methods, and the need for learning resources.

2) Student Questionnaire
Questions in the form of an online questionnaire were given to 50 students regarding learning difficulties, learning styles, and learning resources used in learning, especially the topic of biodiversity.

2.2.2 Design Stage

a. Material preparation
The preparation of material done by searching for materials or sources carried out in accordance with the material to be developed, the material collection point is also accompanied by the collection of supporting images or photos in the biodiversity booklet, the material collection point and images are carried out to optimize the use of the booklet.

b. Format selection
Format selection in booklet development is intended to design or design the contents of the book, the format selection point is carried out by reviewing the format of the booklet format that already exists and determining the format of the booklet developed. The booklet format to be developed includes introduction, the content (the diversity of vertebrates in Siantar Zoo namely pisces, reptiles, aves and mammal class) and closing.

c. Preparation of research instruments
The preparation of research instruments is designed by researchers guided by thesis supervisors to determine the feasibility of booklets from aspects of material, media and responses from biology teachers and students related to the booklet developed.

d. Initial draft
The initial draft is the result of the preparation of material with a specified bouquet format which then produces an initial draft that is ready to be corrected and revised by supervisors and expert lecturers.

2.2.3 Developt Stage

a. The first step is the preparation carried out such as site surveys and location determination. The location chosen to find data in making a biodiversity booklet is Siantar Zoo.
b. The second step is to conduct research on species diversity at Siantar Zoo.
c. The third step is the product development stage, namely the booklet. The booklet was created based on the findings of the diversity identification project at Siantar Zoo. An outline cover, an introduction, a table of contents, learning outcomes, learning objectives, a concept map of the content, practice questions, a glossarium, an index, an author biography, a bibliography, and a back cover are all included in this booklet.

d. The fourth step, namely the product validity test, this validity test collects data in the form of validator assessments or suggestions, and the results are used to establish whether the booklet under development is suitable for release. It is validated by two parties, namely material and media.
e. The fifth step, books that have been validated, revised and then revised again until declared feasible or valid, after that this booklet will be carried out a limited test to see the responses of students and teachers.

In the development stage, several stages of data analysis are carried out:

a. Analysis of the validity of booklet learning media
The Likert scale is used to determine the validity of several categories in this booklet. The results of measuring the Likert scale give data in the form of numbers (Loka et al. 2022) .

Table 1. Booklet feasibility percentage criteria for material and media expert questionnaire instruments

Scale Range	Percentage Interval	Criterion	Description
25-43	25%-43%	Not feasible	The product failed, massively revising the content of the product.
44-62	44%-62%	Less feasible	Revise the booklet by carefully reviewing and looking for product deficiencies to correct.
63-81	62%-81%	Feasible	Booklet products can be used as learning resources without revision.
82-100	82%-100%	Very feasible	Booklet products can be used in the field as a learning resource without revision.

b. Analysis of responses to booklet media
Teacher and student response data was carried out by a limited scale trial The results of the questionnaire filled out by teachers and students were analyzed with the formula (1) (Loka et al. 2022). Formula description:

$$P = \frac{\sum X}{\sum Xi} X\ 100\ \% \quad \text{..... (1)}$$

P = Percentage
$\sum X$ = Number of assessment answers
$\sum Xi$ = The highest number of answers

Table 2. Booklet feasibility percentage criteria for teacger and student questionnaire.

Adopted from (Irmayati, 2018)

Scale Range	Percentage Interval	Criterion	Description
20-34	25%-42,5%	Not feasible	The product failed, massively revising the content of the product
35-49	43,75-61,25%	Less feasible	Revise the booklet by carefully reviewing and looking for product deficiencies to correct
50-64	62,25%-80%	Feasible	Booklet products can be used as learning resources and there is no revision
65-79	81,25%-98,75%	Very feasible	Booklet products can be used in the field as a learning resource and there is no revision

2.2.4 Disseminate Stage

After conducting trials and revisions, the next stage is to disseminate the results of developing learning resources in the form of biodiversity booklets to students and teacher. Booklet biodiversity as a learning resource is expected to help students understand biodiversity topics and can improve student learning outcomes. In the effectiveness test stage, teaching and learning activities will be carried out in two classes, namely the control class and the experimental class. However, the control class did not get treatment using booklets (using the textbooks) while the experimental class used booklets as learning resources.

Data analysis will be carried out using the independent t-test before tested use N-gain. The T-test is an independent t-test which also aims to determine whether there is an average difference between two unpaired samples (post-test control class and experimental class). This T test was carried out using SPSS version 26 software, with the following conditions: If the sig value is <0.05 it can be concluded that there is significant difference (Supriadi, 2021).

After independent t-test, the next test is analysis of student pre-test and post-test using N-gain scores. The N-gain score is a value obtained based on an increase or difference in score which is the difference between the pre-test score and the post-test score. Thus, the results of the N-gain score calculation can determine the effectiveness of booklet development on learning. Analyze written tests to calculate students' final grades in class. The evaluation value will then be analysed so that it can be known the increase of students on the Biodiversity material. Analysis using N-gain score can be done using formula (2).

$$\text{N} - \text{gain} = \frac{\text{Post-test Score} - \text{Pre-test Score}}{\text{Maximum Score} - \text{Pre-test Score}} \quad \text{..... (2)}$$

Table 3. Data Analysis Using N-Gain Value Categories Adopted from (Hake, 2016)

Normalized Gain Score	Normalized Gain Criteria
N-Gain ≥ 0.7	High
0,3 ≤ N-Gain ≥ 0,7	Keep
N-Gain < 0.3	Low

3. RESULT AND DISCUSSION

3.1 Define Stage

a. Problem Analysis

It is known that the existing problem is the lack of learning resources on biodiversity material and there is no direct observation, especially the observation of animal diversity in the material. In addition, the textbooks provided by the school also do not provide examples of animal diversity so that students' understanding and learning experience are not optimal. Thus, the development of booklets as a learning resource should be used as a solution to overcome existing problems. The development of biodiversity booklets is also very important to be carried out in line with the characteristics of biodiversity materials because it requires good visualization in order to understand the learning concepts that can be overcome with the use of booklets (Untung et al. 2024).

b. Need analysis

By knowing the characteristics of students, teachers can determine what learning styles and learning resources will be used for these students to meet the needs of students (Andriani & Nugraheni, 2024). Learning resources are needed that can improve the learning experience and learning outcomes of students. The learning resources developed must be in accordance with the needs of students' learning styles. After observation through an online questionnaire, it was found that 40% of students from the experimental class had visual learning styles, 48% kinesthetic learning styles, and 12% audiovisual learning styles. This means that the developed booklet must be able to be a solution to the needs of students' learning styles, so that the developed booklet contains visual images and explanations as well as making a visit to Siantar Zoo by using the booklet as a guide for students with kinesthetic learning styles. And for students with an audio-visual learning style, initial learning is carried out in the classroom followed by animal observations at the Siantar Zoo. The diversity of learning style characteristics of each student in the classroom is the foundation for teachers in balancing the learning needs of students to achieve broader learning goals (Andriani & Nugraheni, 2024). The use of booklets and observations should be a solution to the diversity of student learning styles at SMA N 1 Pematangsianatar.

c. Curriculum Analysis

Analyzing the curriculum is very important to find out the relationship between the abilities that must be achieved and the learning activities carried out and the learning resources needed (Ramli, 2011). It is known that the independent curriculum is the curriculum used at SMA N 1 Pematangsiantar, with Learning Outcomes (CP) and Learning Aims (TP) which are adjusted to government regulations. The developed booklet focuses on Learning Aims (TP) 10.1.

Curriculum Merdeka provides more freedom to schools in designing curricula according to the needs and potential of students. So that students will also have more opportunities to expose their needs and potential. In this case, learning resources are needed in the learning process so that students are more able to expose, including in biodiversity material. The Vertebrate Diversity Booklet at Siantar Zoo should be a solution to the lack of learning resources at SMA N 1 Pematangsiantar so that curriculum objectives can be achieved.

d. Learning Aims Analysis

In the analysis of learning aims, the developed booklet focuses on Learning Aims (TP): 10. 1 Students can identify the level of Biodiversity. This means that the development of the booklet focuses on subtopics at the biodiversity level starting from the gene, species, and ecosystem levels. And the vertebrate diversity booklet at Siantar Zoo that was developed contains the level of diversity in the classes of pisces, reptiles, aves, and mammals. To realize a learning process that is in accordance with learning objectives, teachers can analyze previous learning concepts as a basis for learning new learning concepts (Budiastuti et al. 2021). In this case, the learning concept in the Kurikulum Merdeka in TP 10.1 is adjusted to the booklet developed to suit the learning objectives.

3.2 Desgin Stage

In the design stage, the researcher has made a prototype or product design. In the context of learning resource development, this stage is carried out to create learning resources in accordance with the content framework of the curriculum and material analysis results. The design stage in this study was carried out to create a learning resource in the form of a booklet that was in accordance with the content framework of the results of the definition stages that had been carried out previously (Hidayati et al. 2022). To support this stage, it is carried out with the preparation of materials, namely biodiversity, selection of formats booklet, preparation of research instruments and preparation of initial drafts.

a. Preparation of Materials

In the preparation of the material, the author took biodiversity material and focused on the subchapter on the level of biodiversity of various animals (vertebrates) in Siantar Zoo.

b. Selection of Formats

The selection of the format for the development of the booklet on the booklet cover, using 260mg cardboard and the contents of the booklet as many as 80 pages using 120mg artpaper with a size of A5 (148 x 210 mm).

c. Preparation of Research Instruments

For the preparation of research instruments, it consists of a material expert questionnaire containing 4 aspects with 25 indicators, there are four aspects that are assessed including content feasibility, depth of material, language feasibility, and presentation. A media expert questionnaire containing 3 aspects with 20 indicators, there are three aspects that are assessed including the feasibility of the booklet, cover design, and content design. A teacher response questionnaire

containing 2 aspects with 25 indicators, there are content feasibility Anda feasibility of servinf. A student response questionnaire containing 3 with 20 indicators. There are content feasibility, design and linguistics with each with 4 criteria choices, namely very feasible, feasible, less feasible, and not feasible. And the booklet effectiveness test, 30 pre-test and post-test questions are used with 5 answer options that have been declared valid by the validator.

d. Preparation of Initial Drafts

For the initial draft, with the arrangement of 1) Cover 2) Preface 3) Table of content 4) Learning Outcomes (CP) and Learning Aims (TP) 5) Concept map of content 6) Introduction to biodiversity material 7) The content (the diversity of vertebrates in Siantar Zoo namely pisces, reptiles, aves and mammal class) 8) Bilbiography 9) Glossary 10) Index 11) Author biography 12) Back cover. And the content of the description booklet for each species in the form of morphology and animal distribution and make a description for each image according to the direction of the supervisor.

3.3 Develop Stage

The booklet media along with the media assessment instruments that have been prepared are then validated by material experts, media for the purpose of product improvement and asking for responses from biology teachers and students before distributing booklets to class X of SMAN 1 Pematangsiantar.

a. Data Analysis of product assessment results by material experts and media experts

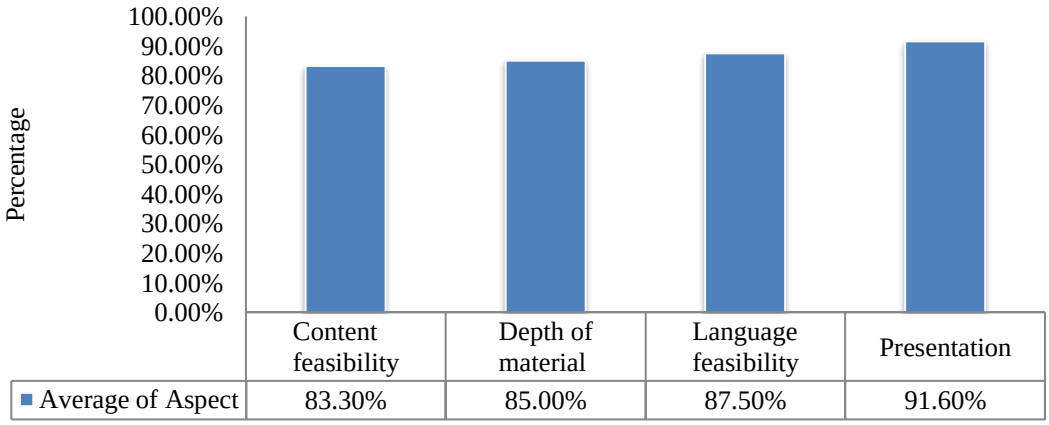

Figure 2. Diagram of the percentage of material expert assessments

Based on figure 2, in the assessment of material experts, there are four aspects that are assessed including content feasibility, depth of material, language feasibility, and presentation. These four aspects are further divided into several indicators with the number of description items that must be assessed as many as 25 items. The assessment of material experts received an average of 88% with the criterion of "very feasible". After the assessment is carried out, input and suggestions are obtained from validators who will be the basis for product revisions.

In this case, related to the content feasibility, the booklet developed has been able to support learning on the topic of biodiversity and the material presented fosters curiosity in students with the material presented can be used as a source of learning accurate and complete information. This is in line with the function of learning resources as all supporting resources that students use as a source for learning activities and can improve the quality of their learning (Seels & Richey, 1994). In terms of material depth, materials are a very important component in the curriculum, so the teaching materials for learning need to be prepared optimally so that the goals of learning can be achieved (Nisa et al. 2012). For language feasibility, the information in the booklet needs to be compiled using concise language and easily understood in a quick time. So that the use of communicative language in booklets can support the implementation of effective and efficient learning (Choirina et al. 2023). The sustainability of the presentation is an important factor in stimulating students' interest because it presents the information in a clearer, more succinct manner with a variety of arrangements that are full of pictures. This helps students understand the information better and lessens their level of boredom, which makes the booklet more engaging and inspiring (Ramadhani et al. 2021).

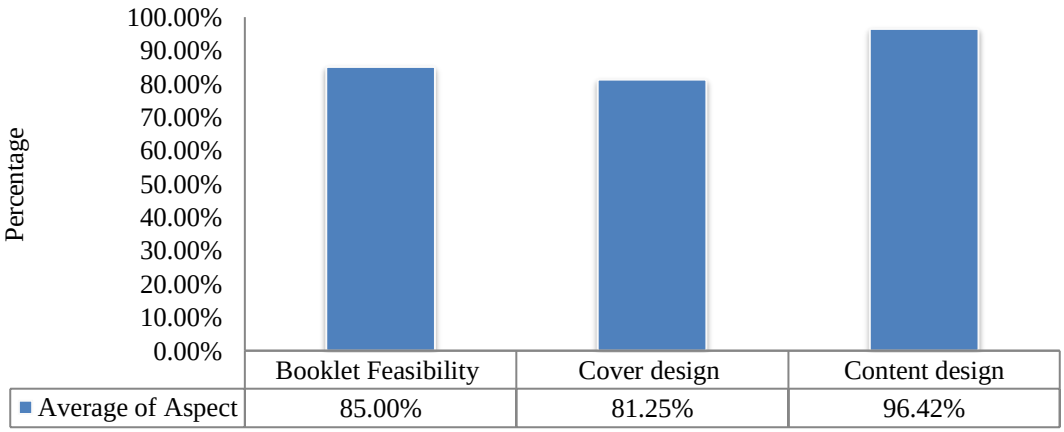

Figure 3. Diagram of the percentage of media expert assessments

Based on figure 3, in the assessment of media experts, there are three aspects that are assessed including the feasibility of the booklet, cover design, and content design. These three aspects are further divided into several indicators with the number of description items that must be assessed as many as 20 items. The assessment of material experts received an average of 87.5% with the criteria of "very feasible". After the assessment is carried out, input and suggestions are obtained from validators who will be the basis for product revisions.

In the terms of booklet feasibility related to the format of the booklet, which is the format of the booklet is in accordance with the general format, in line with the statement that the booklet is generally ISO standardized, A4 (210x297mm), A5 (148x210mm), and B5 (175x250mm) sizes with a tolerance of 0-22 mm size difference. This is in accordance with the opinion that that one of the criteria for learning media that needs to be considered is the compatibility between the media and the quality of the paper used (Susilana & Riyana, 2009). According to Mustafa & Efendi (2016), cover design is also crucial for learning resources. They state that stimuli in the form of pictures or illustrations can be placed in various parts of a teaching material, such as the cover and contents, to increase student interest in the material. Moreover, content design is a crucial component of educational materials since it deals with the visual elements that influence students'

motivation and level of interest in the subject matter. so that the execution of efficient and effective learning can be supported by booklets with effective material (Choirina et al. 2023).

b. Data analysis of product response results by Biology teacher and students

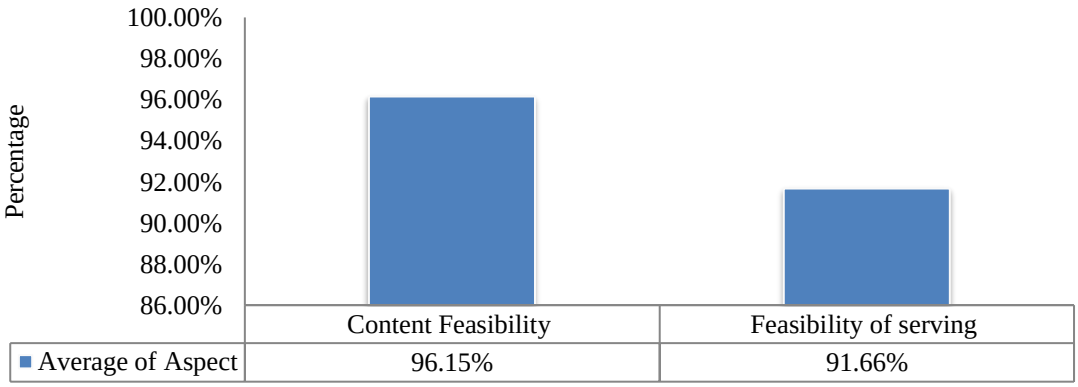

Figure 4. Diagram of the percentage of Biology teacher response

Based on figure 4, the average percentage of assessment from the teacher's response is 94% with very feasible criteria. The booklet developed has met the feasibility aspect of the content where the vertebrate diversity material at Siantar Zoo can be useful for readers. The material presented can foster curiosity in students. The material is in accordance with PUEBI which is easy for students to understand, with the right writing and layout. In addition, the feasibility of presentation is also good with the appearance and size of the image in accordance with the proportions and color composition with an attractive design appearance. Based on the teacher's response to the booklet, it is known that the booklet has met the feasibility of the content and presentation as well. According to the students, the booklet developed already has interesting material conversations with various pictures of vertebrate animals at Siantar Zoo which increases curiosity in students. The booklet is arranged with attractive pictures with various information that makes it easier for students to understand. The booklet is also designed with a cover that is in line with the content of the language that is easy to understand with an interesting combination of types and letters. The booklet is also supported by different color contrasts with the use of spelling, language and sentences that are easy to understand so that it is easier for students to understand. In addition, the teacher stated that the booklet was good and could be used in the learning process. The booklet has been declared feasible in terms of feasibility of content and serving. A booklet's viability is determined by whether or not its contents align with the knowledge that students require to advance their understanding (Dewi & Sri, 2018). If the information in the booklet includes all relevant subject matter and material specifics, the product presentation is considered legitimate (Syamsurizal et al. 2021).

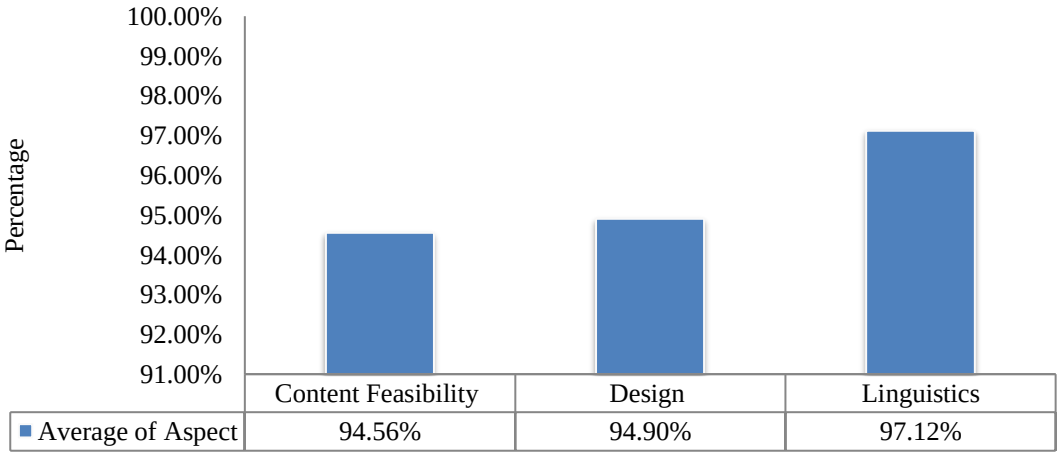

Figure 5. Diagram of the percentage of student responses

Based on figure 5, the average percentage of assessment from the student responses is 95.21% with very feasible criteria. Based on the teacher's response to the booklet, it is known that the booklet has met the feasibility of the content and presentation as well. Not only that, the responses from several students also lead to positive explanations that can be seen in the assessment questionnaire for students, such as booklets are suitable for development, facilitate the learning process, the media is good enough, the media is interesting, with the help of booklets, students can gain a better comprehension of learning and become more engaged in the process. Good media that is used effectively will definitely maximize students' attention to the many themes to be discussed, and media as a learning aid will maximize students' motivation and interest, as well as raise students' focus, so that the learning process and results are better (Lin et al. 2017).

3.4 Disseminate Stage

Booklets that have gone through various stages of development and have been declared suitable for use as a learning resource on biodiversity material by material and media validators will then be distributed by students to analyze the effectiveness value of products based on limited group tests.

Figure 6. Chart of Average Comparison of Pre-test and Post-test Scores Between Control and Experimental Class

The trial conducted by the researcher was in grade 10 IKM 8 SMA N 1 Pematangsiantar as many as 36 students with different levels of ability ranging from high, medium, to low. The researcher gave an initial ability test or pre-test to students with a total of 30 multiple-choice questions. Based on Figure 6, the average pre-test result in grade 10 IKM 12 or control class is 52.55. The average pre-test result in grade 10 IKM 8 or experimental class is 51.17. This initial ability test was carried out to see how students were able at the beginning of learning before being given treatment, namely the provision of booklets as a learning resource. It is evident from the average score that students did not comprehend the biodiversity subject matter, especially at the level of biodiversity of various vertebrates at Siantar Zoo as one of the conservation tours that provide various diversity of vertebrate animals. After that, grade 10 IKM 8 was given treatment by learning biodiversity material accompanied by the provision of vertebrate diversity booklets at Siantar Zoo as a learning resource accompanied by a direct visit to Siantar Zoo so that a more real learning experience was obtained.

The pre-test and post-test data that have been obtained will then be tested for normality and homogeneity before continuing with the t-test. The results of the normality and homogeneity tests are shown in table 4 dan table 5. Based on the results of the normality test calculation shown in table 4, it is stated that the distribution of the posttest in the control class is 0.129 which is 0.129 > 0.05 so that the posttest control value is distruded normally. And the significance of the experimental posttest value is 0.090 which is 0.090>0.05 so that the experimental posttest value is also distruncated normally. The criteria for the homogeneity test in SPSS with the Levene test is if Sig >0.05, then Ho is accepted. Based on the results of the homogeneity test calculation in table 5, there is a Sig value of 0.764. So, Sig 0.764> 0.05 so Ho is accepted. This means that the pretest and posttest data of the control class have homogeneous variants.

Table 4. Result of the Posttest Normality Test of Control and Experimental Classes

Tests of Normality

	Class	Shapiro-Wilk		
		Statistic	df	Sig.
Value	Posttest of Control	.953	36	.129
	Postest of Experimental	.948	36	.090

a. Lilliefors Significance Correction

Table 5. Result of Posttest Homogeneity Test for Control Class and Experimental Class

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Nilai	Based on Mean	.091	1	70	.764
	Based on Median	.060	1	70	.808
	Based on Median and with adjusted df	.060	1	68.747	.808
	Based on trimmed mean	.120	1	70	.730

After the data is declared normal and homogeneous, the data will be tested using a t-test. Based on the results of the independent samples t-test of the control class posttest value and the experiment in the table 6, it can be seen that the value of Sig 2-tailed is

0.000. So, it can be stated that the significance value is 0.000 <0.05. which shows that there is a difference in learning outcomes between the experimental class (using booklets) and the control class (using textbooks).

Table 6. Result of Independent samples t-test

		Levene's Test for Equality of Variences		t-test for Equality of Means				
		F	Sig.	t	df	Sig(2-tailed)	Mean Difference	Std. Error Difference
Value	Equal variances assumed	.091	.764	-13.926	70	.000	-20.85278	1.49736
	Equal variances not assumed			-13.926	68.803	.000	-20.852781	1.49736

Based on the results of the independent samples t-test of the control class posttest value and the experiment in the table 6, it can be seen that the value of Sig 2-tailed is 0.000. So, it can be stated that the significance value is 0.000 <0.05. which shows that there is a difference in learning outcomes between the experimental class (using booklets) and the control class (using textbooks).

Table 7. N-Gain Scores of Experimental Class and Control Class

Score	Experimental Class (Use booklet)	Percentage (%)	Control Class (use textbooks)	Percentage (%)	Criteria
N-Gain ≥ 0.7	11	30.6 %	0	0 %	High
0,3 ≤ N-Gain ≥ 0,7	25	69,4 %	9	25%	Medium
N-Gain < 0.3	0	0%	27	75%	Low

Based on the Table 7, in the experimental class using a booklet of 36 students, there were 11 students who obtained N-Gain>0.7 with high criteria. Students who obtained 0.3 ≤ N-Gain ≥ 0.7 totaled 25 people with moderate criteria. And the average N-Gain value of the experimental class is 0.625 which is included in the moderate criteria. Meanwhile, in the control class, which did not use booklets, there was only 1 student who obtained an N-Gain of 0.7 which is included in the high criteria. There were 9 students who obtained 0.3≤N-Gain ≥ 0.7 which is included in the medium criteria. There were 27 students who obtained N-Gain <0.3 which is included in the low criteria. And the average N-Gain value in the control class was 0.105 which is included in the low criteria. Based on this statement, it can be interpreted that the vertebrate diversity booklet at Siantar Zoo is quite effective as a learning resource with an average score of N-Gain of 0.625 with moderate criteria.

Based on the presentation of the research's investigation of student learning results after using the Booklet, it is possible to conclude that using the Booklet as a learning

resource improves student learning outcomes. In this case, the control class observed vertebrates at Siantar Zoo without using a booklet as a learning resource. So, they only observed freely without any supporting references in making observations, both in terms of morphology, distribution, and others. While the experimental class observed vertebrates at Siantar Zoo accompanied by a Booklet as a learning resource. So, they made observations more focused in line with the references in the booklet. Based on the difference in the average posttest between the control class and the experiment, it was proved that the product of the development of the Vertebrate Diversity Booklet at Siantar Zoo on biodiversity material increased higher learning outcomes in the experimental class, namely X IKM 8 compared to the control class, namely X IKM 12 SMA N 1 Pematangsiantar. This is consistent with the assertion that the amount of efficacy of learning materials can be described on a numerical scale based on certain criteria of possible effects in the form of quality of learning outcomes, attitudes, and motivation of students (Reigeluth, 1983). The N-Gain value obtained also demonstrates that there is an increase in the average score of the pre-test and post-test, indicating that the vertebrate variety booklet at Siantar Zoo is quite helpful in boosting student learning results. This is backed by Imtihana's (2014) research, which says that research-based booklets are a useful learning resource. Biology learning using booklets can be done within and outside of the classroom, making biology learning flexible and not restrictive (Fauziyah, 2017).

4. CONCLUSION

To obtain the feasibility, practicality and effectiveness of the booklet, a validity test was conducted based on material experts and media experts, followed by a practicality test through teacher and student responses, then an effectiveness test analyzed by the experimental design T test and N-Gain. The booklet has been assessed as very feasible by 88 percent of material experts and 87.5 percent of media experts, and assessed as very practical by 95.21 percent of teachers and 94% of students. For the effectiveness test, the results of the t-test were obtained with a significance of 0.000 <0.05, which showed that there was a difference in learning outcomes between the experimental class and the control class. The N-Gain test showed an average N-Gain score of 0.625 and was included in the moderate category, indicating that the vertebrate diversity booklet at the Siantar Zoo was proven to be quite effective as a learning resource. For the next researchers, it is recommended that the assessment by the expert team be carried out by at least two expert teams, as a comparative material in assessing the product. Then, to get maximum results, it is necessary to conduct further research on a larger and wider sample. And to see the effectiveness of the product, it should be done with more complete and complex stages, especially at the product trial stage.

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