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Development of Teaching Materials for *Booklets* on the Dynamics of Planet Earth As a Living Space in the Class X Merdeka Curriculum at SMAN 1 Mandastana

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Abstract

The research is motivated by LKPD (Learner Worksheet) teaching materials used in monotonous schools that some students need help understanding, especially in the material on the dynamics of planet Earth as a living space. The research aims to produce a development product in the form of a booklet on the material of the dynamics of planet Earth as a living space to produce a booklet that is feasible and practical to use. The research method used is Research and Development (R&D) with the 4D model developed by Thiagarajan, namely Define, Design, Develop, and Disseminate, but in this study, it was modified only until the Develop stage. The study used quantitative data based on the validator's assessment questionnaire score and qualitative data based on criticisms and suggestions from validators regarding the teaching materials developed. The results of the research are in the form of booklet development products on the dynamics of planet Earth as a living space with the results of material feasibility 78%, linguistic feasibility 78.03%, and design feasibility 80% so that the booklet is declared feasible with a percentage of feasibility 78.03% and declared very practical with a percentage of practicality 85.52%.

Keywords: Development, teaching materials, booklets, 4D Model

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1. Introduction

Learning is an interaction process between students and students with learning resources (Firmadani, 2020). The learning process occurs through communication in conveying information to achieve a learning goal (Hasan et al., 2021). Learning objectives can be hampered due to a lack of learning information sources, so strategies are needed in the learning process (Firmadani, 2020). A source of learning information that can assist the learning process and foster students' learning motivation is teaching materials that attract students' interest (Moto, 2019).

Teaching materials are learning tools that help provide students maximum understanding of the material to achieve effective and efficient learning (Aziza, 2021). Teaching materials function as an intermediary for students in receiving information to reduce obstacles in the learning process, stimulate the motivation of students and educators in the learning process, and maximize the learning process (Hasan et al., 2021). The benefit of teaching materials is that they can be realized in concrete form so that learning is not monotonous (Rohani, 2019).

Teaching materials are grouped into several types, namely print, audio, visual, and audio-visual media. Visual teaching materials include photos, pictures, charts, graphs, posters, and cardboard. Audio-visual teaching materials include videotapes, DVDs, and internet videos. Audio teaching materials include radio, magnetic tape recorders, vinyl records, and everything related to the sense of sound. Printed teaching materials include books, brochures, leaflets, modules, LKPD, handouts,, and booklets (Magdalena et al., 2020).

Booklets are printed teaching materials used in classroom learning as books containing interesting pictures, writing, and presenting information (Magdalena et al., 2020). Booklets are informative and designed to attract curiosity so students can easily understand the delivery in the learning process (Pralisaputri KR et al., 2016). The information in the booklet's contents must be clear, precise, easy to understand, and accompanied by exciting pictures. The booklet has at least five pages and a maximum of forty-eight pages, excluding the cover (Pralisaputri KR et al., 2016). The advantages of booklet teaching materials are that the information is educational, more detailed, concise, clear, and equipped with pictures, making the booklet more interesting (Diri & Marlini, 2019). The weakness of booklet teaching materials is that they take a relatively long time to make, and there are still several things that could be improved in the material content and image illustrations (Yusuf et al., 2019).

Identification was carried out at SMAN 1 Mandastana, showing that discussion and lecture methods using LKPD (Learner Worksheets) were teaching materials often used to accompany textbooks. Pictures do not accompany the LKPD (Learner Worksheet), so some students need help understanding. The use of teaching materials can help students' learning process in exploring more comprehensive sources of knowledge, so material in geography subjects requires the development of teaching materials. The material on the dynamics of planet Earth as a living space is complex to teach at SMAN 1 Mandastana because the learning resources in the form of textbooks are incomplete, and there is a lack of exciting teaching materials.

Geography learning at SMAN 1 Mandastana, based on the results of a student analysis questionnaire, stated that the learning resources that are often used in the learning process are 13.3% from the internet and 76.7% from textbooks. 83.3% of the teaching materials used are dominated by LKPD (Learner Worksheets). The teaching materials used have helped focus on the learning process, but 60% of students need help understanding the material when using existing teaching materials. This difficulty is based on the teaching materials used, which do not display attractive images and are challenging to understand—87.5% of class X students like teaching materials that are interesting, colorful, and illustrated. Class X students at SMAN 1 Mandastana need learning objectives included in teaching materials. Students need to develop teaching

materials, and 90% of students need innovation in other teaching materials in the form of booklets. Based on identifying existing problems, it is necessary to develop and analyze booklet-based teaching materials with material on the dynamics of the formation of planet Earth as a living space.

2. Method

The research method used is research and development (*Research and Development*). The research and development model used is a modification of the 4D model (*Define, Design, Develop,* and *Disseminate*) developed by Thiagarajan and modified by (Sari & Cahyono, 2020) only carried out until the dissemination stage (*Disseminete*).

A. Definition Stage (Define)

The definition stage analyzes the requirements to determine the need for the equipment to be developed (Maydiantoro, 2020). The definition stage (Sari & Cahyono, 2020) includes five stages, namely:

1. Front–end analysis
   The front-end analysis stage involves conducting observations, such as questionnaire analyses or interviews, to obtain initial data and identify a fundamental problem at the research location.
2. Learner analysis
   The analysis stage of student characteristics is carried out by knowing the students' characteristics so that they can be adapted to the type of teaching material product that will be developed.
3. A task analysis
   The task analysis stage involves analyzing the scope of material and strategies based on the results of the analysis of learning outcomes (CP) and the flow of learning objectives (ATP).
4. Concept analysis
   The concept analysis stage is carried out by determining the material for developing the teaching materials and preparing the steps that will be carried out rationally with reference to learning outcomes (CP) and the flow of learning objectives (ATP).
5. Specification of learning objectives
   The learning objective specification stage involves formulating a learning objective (TP) appropriate to the curriculum and main material.

B. Design Stage (*Design*)

The design stage is the stage of preparing teaching materials. The design stage, according to (Sari & Cahyono, 2020), includes three stages, namely:

1. Selection of teaching materials
   The teaching material selection stage involves determining the type of teaching material and material that will be developed based on the results of the steps in the definition stage.
2. Format selection
   The format selection stage is carried out by compiling the contents of the teaching materials that are developed in order according to the learning material.
3. Initial design

booklet teaching materials consisting of a front cover, introduction, contents, cover, and back cover to produce an initial product.

C. Development Stage (*Develop*)

The development stage, according to (Sari & Cahyono, 2020), is a process that will produce the final *booklet product* after going through two stages, namely:

1. An expert assessment was conducted to determine the suitability of *the developed booklet teaching materials*. Class x *booklet* The material on the dynamics of the planet Earth as a living space was carried out in a validation test by six experts consisting of a team of material experts, namely two lecturers in geography education, FKIP ULM, a team of language experts, namely one lecturer in geography education and one lecturer in Indonesian literature and language education, as well as a team design expert, namely one geography education lecturer and one educational technology lecturer. The expert assessment analysis technique was obtained from a questionnaire sheet with a Likert scale of 1 – 5, with the highest point being 5, which is very good. The calculation to produce a validation score uses the following formula adapted from (Laili et al., 2021) :

$$\text{Validity Percentage } (\%) = \frac{Acquisition\ score}{ideal\ score} \times 100\% \quad (1)$$

Information:
Acquisition score = total score of assessment results
Ideal score = number of aspects x highest score x number of validators

Once the validity percentage is known, it is compared with the validity criteria in the following table:

Table 1. Feasibility Validation Score

No	Score	Category
1	81.25 % < Score ≤ 100 %	Very Worth It
2	62.50 % < Score ≤ 81.25 %	Worthy
3	43.75 % < Score ≤ 62.50 %	Decent Enough
4	25 % ≤ Score ≤ 43.75 %	Not feasible

2. A practicality test, a limited trial, was carried out on nine students at SMAN 1 Mandastana to determine students' responses to the *booklet teaching materials* that had been developed. The student response analysis technique was obtained from a questionnaire sheet with a Likert scale of 1 – 5, with the highest point being 5, which is very good. Calculations to produce a practicality score use the following formula adapted from Laili et al., (2021)

Once the validation percentage is known, it is compared with the validity criteria in the following table:

Table 2. Practicality Score

No	Score	Category
1	81.25 % < Score ≤ 100 %	Very Practical
2	62.50 % < Score ≤ 81.25 %	Practical
3	43.75 % < Score ≤ 62.50 %	Quite practical
4	25 % ≤ Score ≤ 43.75 %	Impractical

3. Results and Discussion

A. Results

The research and development results have produced teaching material in the form of *a booklet*, which has gone through the validity testing stage of the teaching material's suitability and practicality testing. Testing the *booklet's* suitability uses simplified guidelines from the Curriculum and Educational Assessment Standards Agency (BSKAP) by testing three aspects: the suitability of the material, the suitability of the language, and the suitability of the design. Each aspect is validated by two experts in the field.

Figure 1 Development Results *Booklet*

The practicality of *the booklet* was determined through limited trials by looking at students' responses to *the booklet* on the dynamics of planet Earth as a living space. The results of the development of teaching materials for *booklets* on the dynamics of planet Earth as a living space are as follows.

1. Aspects of material feasibility

The suitability of the material is used to measure the suitability of the content against the suitability of the CP, TP, and ATP presented in *the booklet.* The results of material feasibility validation are presented in the following table.

Table 3. Material Feasibility Results

No	Validator	Evaluation (%)	Information
1	Validator I	80	Worthy
2	Validator II	72.2	Worthy
Average		**76.1**	**Worthy**

The validation results were based on the assessment of 2 geography education lecturers at FKIP ULM as material expert validators in *the booklet on* the dynamics of planet Earth as a living space, getting an average presentation score of 76.1% with appropriate criteria. *The booklet* underwent minor revisions and received suggestions and input from the following expert team.

Table 4. Suggestions and Results for Revision of Material Feasibility

Validator	Suggestion	Revision
Material Expert Validator I and	There are still not enough practice questions and answer	Practice questions have been added at the end of each sub-material in the booklet on

Material Expert Validator II	keys; they need to be added to the booklet	pages 7, 12, and 16, and answer keys have been added to *the CR-Code.*

2. Aspects of Linguistic Appropriateness

Linguistic appropriateness ensures that the language in *the booklet* complies with language rules. Aspects of linguistic appropriateness consist of straightforward, communicative, dialogical, and interactive language, conformity with language rules, and the use of terms, symbols, or icons. The results of linguistic feasibility validation are presented in the following table.

Table 5. Language Eligibility Results

No	Validator	Evaluation (%)	Information
1	Validator I	76	Worthy
2	Validator II	80	Worthy
Average		**78**	**Worthy**

The results of the linguistic feasibility validation were based on the assessment of 2 language expert validator lecturers consisting of 1 geography education lecturer, FKIP ULM, and 1 Indonesian language and literature lecturer FKIP ULM on *the booklet on* the dynamics of planet Earth as a living space, getting an average presentation score of 78% according to the criteria worthy. *The booklet* underwent minor revisions and received suggestions and input from the following expert team.

Table 6. Suggestions and Results for Revision of Material Feasibility

Validator	Suggestion	Revision
Language Expert Validator I	1) Page 2 corrects the spelling of the word equator to equator. 2) Page 3 corrects the writing of the word centrifugal to centrifugal 3) The connecting word then cannot be at the beginning of the sentence 4) The word urgent is changed to a more standard word 5) Writing foreign words is printed/ using *italics* 6) Each image is given an image caption	1) The incorrect word on page 2 has been corrected to equator. 2) The incorrect word on page 3 has been corrected to centrifugal. 3) All connecting words at the beginning of the sentence have been replaced. 4) The word urgent has been removed 5) Foreign language writing already uses *italics* 6) Each image has been provided with an image caption.
Language Expert Validator II	Correct the use of language to suit EYD	*The booklet* has been rechecked, and the words that do not match the EYD have been corrected.

3. Aspects of Design Feasibility

Design feasibility measures the suitability of the illustrations and images in *the booklet.* Aspects of design feasibility include size, cover design, and media content design. The results of the design feasibility validation are presented in the following table.

Table 7. Design Feasibility Results

No	Validator	Evaluation (%)	Information
1	Validator I	80	Worthy
2	Validator II	80	Worthy
Average		**80**	**Worthy**

The results of the design feasibility validation were based on the assessment of 2 design expert validators, consisting of 1 lecturer in geography education at FKIP ULM and 1 lecturer in educational technology at FKIP ULM. Regarding *the booklet on* the dynamics of planet Earth as a living space, the booklet received an average presentation score of 80% with very feasible criteria. *The booklet* underwent minor revisions and received suggestions and input from the expert team, which are presented below.

Table 8. Suggestions and Results of Design Feasibility Revision

Validator	Suggestion	Revision
Media Expert Validator I	7) Any unclear images are replaced 8) Include the source for each image	1) The image on page 2 is unclear and blends in with *the background,* so it must be replaced. 2) Each image has its source included.
Media Expert Validator II	1) Consistency of typeface needs to be considered 2) The font size should be consistent on every page 3) Images and illustrations need to be provided with a reference source 4) Consistency in *background usage* needs to be improved 5) Please pay attention to the colors of the boxes and *fonts;* some of them do not contrast	All suggestions have been corrected in *the booklet*

4. Results of validation of the suitability of booklet teaching materials

The results of the validation score calculation for the suitability of teaching materials for the booklet on the dynamics of the planet Earth as a living space regarding the aspects of material suitability, linguistic suitability and design suitability are presented in the following table.

Table 9. Results of Feasibility Validation of Booklet Teaching Materials

No	Aspect	Score Percentage (%)
1	Material Feasibility	76.1
2	Linguistic Feasibility	78
3	Design Feasibility	80
Amount		**234.1**
Average Percentage Score (%)		**78.03**
Validation Criteria		**Worthy**

Booklet teaching materials can be used in learning because the validator declared them suitable with a score of 78.03%. After the teaching materials have been validated and revised according to suggestions and input from experts, they can be tested in schools.

5. Practical results of booklet teaching materials

Practicality is the student's response to the booklet that has been developed. Student responses were obtained through limited trials by 9 class XI students of SMA Negeri 1 Mandastana. The results of the practicality of booklet teaching materials can be presented in the following table.

Table 10. Practical Results of Booklet Teaching Materials

Student Response		
Assessment Aspects	**Overall Score**	**Overall Criteria**
Appearance Presentation of Material Benefit	85.52%	Very Practical

Based on the assessment of 9 classes, the booklet underwent minor revisions. Based on student suggestions, the booklet on the dynamics of planet Earth as a living space has been improved and developed to be even better.

B. Discussion

The development of teaching materials carried out in research resulted in a product in the form of booklet teaching materials. The teaching materials developed are for the class X SMA/MA Geography subject, including material on planet Earth's dynamics as a living space. The development model carried out is a 4D model developed by Thiagarajan, which consists of Define, Design, Develop, and Disseminate, which has been modified by (Sari & Cahyono, 2020) by implementing three of the four stages of Thiagarajan 4D development which consists of defining, designing and developing. The definition stage (Define) is the initial stage for determining the definition of learning requirements by analyzing the objectives and material boundaries of the tools being developed. It consists of front-end analysis, student analysis, task analysis, concept analysis, and learning objective analysis.

The design stage is a process for preparing teaching materials to be developed. It consists of selecting teaching materials, the format, and the initial design. The development stage (Develop) is the process of designing a learning product which is carried out through expert validation. The validation stage is carried out as a test of product suitability. This stage is divided into two implementations, namely expert appraisal and developmental testing.

The expert assessment consists of 3 aspects, namely the material aspect, with a result of 76.1% in the appropriate category; the linguistic aspect, 78% in the appropriate category; and the design aspect, 80% in the appropriate category. The average validation of the feasibility of booklet teaching materials is 78.03% with the appropriate category. The student response test was carried out on a limited basis by 9 class X students with a practicality result of 85.52% in the very practical category.

4. Conclusion

The booklet teaching material on the dynamics of the planet Earth as a living space for class X geography subjects has been developed using research and development methods. The development model used is the 4D (*four-D) model with define, design, develop,* and *disseminate* stages; however, this research adapted it from research (Sari & Cahyono, 2020) only up to the *developing stage.*

The define stage consists of front-end analysis, learner analysis, task analysis, concept analysis, and specification of learning objectives. At the define stage, questionnaires were distributed, interviews were conducted, and CP, TP, and ATP were analyzed to raise initial problems and characteristics of students and determine the concept of *the booklet* to be developed.

The design stage consists of selecting teaching materials, selecting formats, and initial design of teaching materials. The *design* stage is carried out as an initial development plan, which refers to the results obtained at the *defined stage*. *The design* stage produces an initial *draft* called *draft* I which consists of introduction, content and conclusion. Teaching materials in the form of booklets are made coherently, equipped with attractive illustrations and colors, and arranged concisely so that they can increase students' understanding of the material being taught. This is in line with research (Hafizah et al., 2022), which states that *booklets* are small. It is simple, with concise and precise information, and equipped with attractive supporting colors and illustrations.

The development stage includes a feasibility test by material experts, language experts, and design experts, followed by a practical test or limited trial to see students' responses to the *booklet teaching materials* being developed.

The results of the validation of the feasibility of developing a booklet on the dynamics layer of planet Earth as a living space have a validity value of material feasibility of 76.1%, linguistic feasibility of 78%, and design feasibility of 80%, so an average validation value for the feasibility of the booklet is 78.03% with appropriate criteria and can be used as teaching material to support the dynamic layers of planet Earth as a living space for class X at SMAN 1 Mandastana. The results of students' responses to the booklet teaching materials on the layers of dynamics of planet Earth as a developed space for life obtained a practicality score of 85.52% with efficient criteria.

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