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A Multimodal Thematic Teaching Material Application for Supporting Blended Learning In Elementary Education

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ABSTRACT

This research is motivated by the conditions in the field where so far the teacher teaches still using printed teaching materials, and other separate learning resources that must be prepared in advance and are not yet available in the package books used so that the teaching materials are less practical and complete, related to this condition, the researcher aims to develop a Multi Modal Teaching Material Application Product with the object of developing Thematic Teaching Materials in grade 5 Elementary School / Madrasah Ibtidaiyah. The method used is the R&D model with 4D steps according to Tagarajan. Starting from the stages of defining, designing, developing, and distributing products. But in this study it is only limited to producing products only (Product Validation) the next stage is carried out in the next study. The techniques used include discussions with experts on product design, distributing Product Validation questionnaires. The data obtained were then analyzed using qualitative and quantitative approaches. The results showed that multimodal teaching materials were developed by involving 8 PGMI students. Products validated by experts, consisting of 8 media experts and learning material experts. The results showed data Validation of product feasibility of 3.94 or 98.2% with a very feasible category. Product feasibility validation data from the media aspect shows 3.97 or 99% with a very feasible category. Product feasibility validation data from the material content aspect shows a value of 3.94 or 98.5%, a value indicating that the material in this application is very feasible. So it can be concluded that the multimodal teaching materials developed have a level of feasibility as a product Multimodal teaching materials show very feasible results as Multimodal Thematic Teaching Material Applications and can be continued in the next research hold from the R & D ledge Test practicality and effectiveness in limited and widespread fields to then be distributed as Teaching Materials in the field.

Keywords: Multimodal; Teaching Material; Elementary Education

ABSTRAK

Penelitian ini dilatarbelakangi oleh kondisi di lapangan dimana selama ini guru mengajar masih menggunakan bahan ajar cetak, dan sumber belajar lain yang terpisah yang harus dipersiapkan terlebih dahulu serta belum tersedia dalam buku paket yang digunakan sehingga bahan ajar tersebut kurang praktis dan lengkap, terkait dengan kondisi tersebut maka peneliti bertujuan untuk mengembangkan Produk Aplikasi Bahan Ajar Multi Modal dengan objek pengembangan Bahan Ajar Tematik di kelas 5 Sekolah Dasar/Madrasah Ibtidaiyah. Metode yang digunakan adalah model R&D dengan langkah-langkah 4D menurut Tagarajan. Dimulai dari tahap pendefinisian, perancangan, pengembangan, dan pendistribusian produk. Namun pada penelitian ini hanya sebatas menghasilkan produk saja (Validasi Produk) tahap selanjutnya dilakukan pada penelitian selanjutnya. Teknik yang digunakan meliputi diskusi dengan pakar mengenai desain produk, penyebaran angket Validasi Produk. Data yang diperoleh selanjutnya dianalisis menggunakan pendekatan kualitatif dan kuantitatif. Hasil penelitian menunjukkan bahwa bahan ajar multimoda dikembangkan dengan melibatkan 8 mahasiswa PGMI. Produk divalidasi oleh para pakar, yang terdiri dari 8 orang ahli media dan ahli materi pembelajaran. Hasil penelitian menunjukkan data Validasi kelayakan produk sebesar 3,94 atau 98,2% dengan kategori sangat layak. Data validasi kelayakan produk dari aspek media menunjukkan nilai 3,97 atau 99% dengan kategori sangat

layak. Data validasi kelayakan produk dari aspek isi materi menunjukkan nilai 3,94 atau 98,5%, nilai tersebut menunjukkan bahwa materi pada aplikasi ini sangat layak. Maka dapat disimpulkan bahwa bahan ajar multimoda yang dikembangkan memiliki tingkat kelayakan sebagai produk Bahan ajar Multimoda menunjukkan hasil sangat layak sebagai Aplikasi Bahan Ajar Tematik Multimoda dan dapat dilanjutkan pada penelitian berikutnya yaitu uji kepraktisan dan keefektifan pada bidang terbatas dan luas untuk kemudian disebarkan sebagai Bahan Ajar di lapangan.

Kata kunci: *Multimoda; Bahan Ajar; Pendidikan Dasar*

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A. INTRODUCTION

The pandemic that has hit the world, practically has an impact on the world of education. Face-to-face learning that is routinely carried out must be stopped. Various ways are carried out by teachers so that the teaching and learning process can still be carried out (Hanifah Salsabila et al., 2020). Face-to-face learning then switched to virtual face-to-face, assignments, even in some schools only limited to giving package books for students to learn at home. This certainly has an impact on students' understanding that is not optimal.

Several studies and alternative steps were carried out by teachers. As a study conducted by Rogantina (2017) suggests that the role of technology is very important for improving the quality of education. Another study conducted by Arizona et al., (2020) revealed that the role of online learning allows teachers to continue to provide learning services to students. Setyaningrum et al. (2023), also states that Digital-based teaching materials have been developed and found to be valid, practical, and effective in supporting the science learning process. Despite the guidelines for implementing thematic learning being developed by the Ministry of National Education, educators still frequently express concerns about applying this approach. In addition to limited learning resources, there are also gaps in the available teaching materials, prompting teachers to seek supplementary instructional resources for classroom support (Triningsih et al., 2023).

Learning using digital technology or online learning such as online learning using LMS, learning videos uploaded on personal or school YouTube channels, for providing teaching materials to students at first glance can be seen as a solution, but from Sabran & Sabara, (2018) states that 77.27% of LMS such as *Google Classroom* are effectively used in learning during a pandemic. But if studied in depth, of course, it still leaves problems such as the need for internet availability in learning or when watching learning videos, or limited information if only teaching materials are provided. So that teacher creativity to make a breakthrough is the key to its success (Dewi, 2020). One breakthrough that can be used as a solution is to combine several solutions into one, such as multimodal teaching materials.

The development of textbooks using the *3d page flip* application as teaching materials that use IT-based learning media is interesting to study because the use of technology in development has a significant impact on the effectiveness of learning in the digital era can be a solution in overcoming the above problems. The use of the 3D *PageFlip* application in making textbooks introduces interactive and visual aspects that are richer than conventional print media, so that it can increase student attractiveness and motivation to learn. In addition,

information technology (IT) based learning encourages students to be more active and involved in the learning process, which is in accordance with the demands of 21st century skills such as digital literacy and critical thinking and can help solve problems related to information-rich learning resources that can be used by students and teachers wherever they are, simply by using an android cellphone.

Given that the teaching materials developed are not the development of computer application programs, the indicators in determining the learning media program must be integrated and easy to create or present, the completeness of the media program documentation must also be guaranteed and officially used in schools, learning videos (clear, in accordance with the material, and in order), images (clear, illustrating the completeness of the material examples), and can be *reused*, namely part or even the entire learning media program developed can be used and even developed again on other materials and media.

In terms of visual communication, it includes several aspects such as (a) the appropriateness between the desired message achieved and the message sent; (b) the pouring of creative ideas; (c) attract attention even if it is presented in a simple form; (d) the appropriateness and suitability of audio both in terms of narrative, sound effects, backsound, and music accompaniment (e) visual aspects (layout design, typography, and colors) that are interesting; and (f) Equipped with motion animation.

Concept Theories

In the context of primary education, the implementation of *blended learning* can help to create a more dynamic and diverse learning experience, as it is able to combine the advantages of live and virtual learning. According to Graham (2006), *blended learning* offers time and place flexibility, which increases accessibility to learning resources and allows students to learn at their own pace.

The implementation of *blended learning* requires appropriate and effective teaching materials. Yuliana et al. 2018), stated that the government's textbooks used by the teacher and students in the learning process seem to have some weaknesses both intheir content and materials. The current teacher's and students' textbooks used in elementary schools only contain few students' worksheets in which the materials coverage were not complete and less wide. Multimodal thematic teaching materials are a potential solution because they are able to present material through various types of modalities, such as text, audio, video, animation, and interactivity, which can be tailored to student needs. Thematic teaching materials are teaching materials designed based on certain themes that integrate various fields of study. This method helps students to understand the material holistically by connecting various relevant concepts. According to Drake (2007), thematic learning can improve students' understanding because they see interdisciplinary connections in a more real context.

Meanwhile, multimodal teaching materials refer to the use of multiple forms of modalities to convey information. Modalities in learning include different types of representations, such as visual, auditory and kinesthetic. Several studies have shown that teaching materials that combine these modalities are more effective in supporting student retention and understanding. Mayer's *Cognitive Theory of Multimedia Learning* states that humans learn better from words and pictures than from words alone. By integrating visual, auditory and kinesthetic elements, multimodal teaching materials are able to serve a variety of student learning styles.(Mayer, 2014)

In the context of primary education, implementing *blended learning* presents its own

challenges, mainly due to the limited age and technological skills of students. However, research by Singh & Thurman (2019), shows that if teaching materials are designed effectively, students at the primary level can make good use of online learning. One of the important factors in the implementation of *blended learning* at primary level is providing interactive and accessible teaching materials for students. Multimodal thematic teaching materials are key in achieving this goal, as they are able to attract students' attention and make the learning process more interesting and meaningful. Al Fajri, (2018) stats that in the context of text analysis, multimodal refers to an approach that combines linguistic analysis tools and techniques—such as systemic functional linguistics (SFL) or functional grammar—with tools for analyzing images when the text being analyzed incorporates both verbal and visual modes.

The application of multimodal thematic teaching materials to support *blended learning* offers various advantages in basic education. First, the app allows teachers to organize materials that can be accessed by students outside of class, so that students can learn independently with the support of technology. Second, the multimodal teaching materials developed in the app can be tailored to various student needs, such as providing audio-enhanced text for students with reading disabilities or interactive videos to strengthen concept understanding.

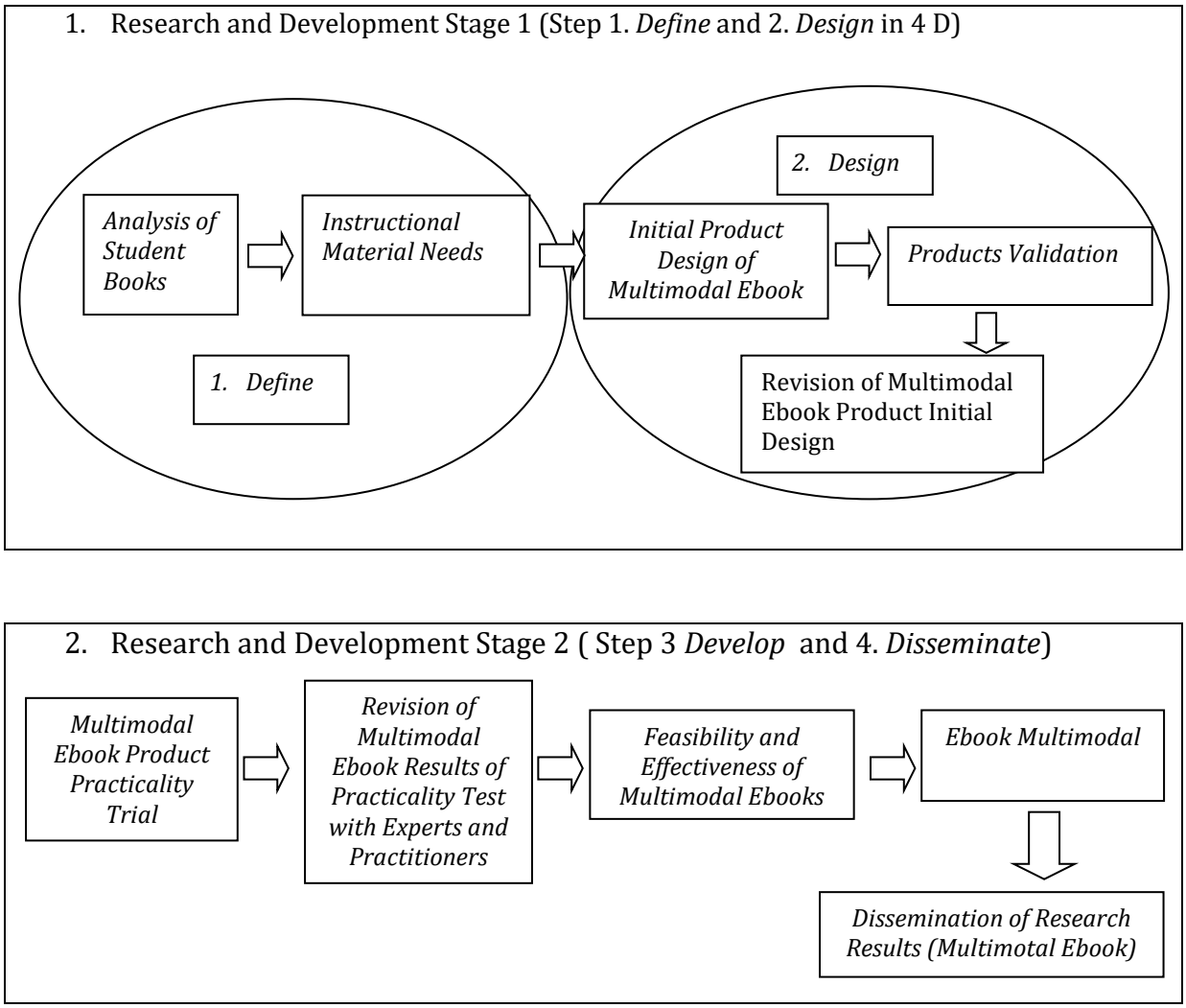
According to Lim & Wang (2016), the use of technology-based applications that integrate multimodality in learning can increase students' motivation and strengthen their understanding of the material. In addition, it also provides flexibility for teachers in managing students' learning time, both in class and at home, in accordance with the principle of *blended learning*.

B. METHOD

This development uses the Four-D development research model initiated by Thiagarajan et al., (1974). The stages of this development include 4 stages, namely *Define*, *Design*, *Develop* and *Disseminate*. This model was chosen in developing learning tools because it has the right stages and systematics to develop multimodal teaching materials (Thiagarajan et al., 1974).

But in its implementation, the development research was carried out in two paying research priodies involving 8 students in each research period. This article only contains the results of research in the first period which produced 8 Multimodal Ebook Applications for grade V elementary school. The reason for choosing fifth grade is because fifth grade students are more familiar with using Android phone media in learning

The four stages are presented in the following chart image:



Draw 1 Multimodal Teaching Materials Stage Development Chart (Thiagarajan et al., 1974)

The *define* stage is carried out with several activities such asnalyzing the development objectives, namely producing multimodal teaching material products, nalysing classes that aim to find out the characteristics of students and the difficulties they experience, studying curricula and textbooks, and theories that support development. The details of the products produced are based on the findings of the study results.

The *define* stage is carried out with several activities such as analyzing the development objectives, namely producing multimodal teaching material products, conducting a class analysis which aims to find out the characteristics of students and the difficulties they experience, studying the curriculum and textbooks, as well as theories that support development. The details of the products produced are based on the findings of the study results.

The design stage includes collecting teaching materials such as learning videos, images and additional information, processing and compiling multimodal teaching materials, drafting teaching materials and compiling and finally converting the teaching materials produced into APKs which will then be tested for the feasibility of multimodal teaching material products. The questionnaire instrument for the validity of the feasibility of teaching materials was

developed using a Likert scale which contains aspects of curriculum suitability, meaningfulness in learning and appearance using positive and negative statements in accordance with Sugiyono's opinion (2010: 109). The instrument is then given an assessment score which includes very feasible (4), feasible (3), inappropriate (2) and very inappropriate (1).

Practicality test and dissemination stage. Will be carried out in the second stage of development research which also involves 8 PGMI Study Program students as paying research.

Table 1
Eligibility Conversion Rate

No	Score Average	Eligibility Rate
1	3.01-4.0	Very Eligible
2	2.01-3.00	Eligible
3	1.01-2.00	Not Eligible
4	0-1.00	Very Unfit

Source: (Sugiyono, 2010)

C. RESULT AND DISCUSION

Research on the development of multimodal thematic teaching material applications for grade 5 SD / MI students. using the Four-D Model development model from Thiagarajan, Dorothy, and Melvyn. The Four-D Model consists of 4 stages, namely *Define* , *Design* , *Develop* , and *Disseminate* . But in this First Development Stage, the research focused on the initial stages, namely the **define** and **design** stages.

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1. Define Stage

In this stage, a needs analysis is carried out based on the curriculum, teaching materials, and characteristics of grade 5 SD / MI students. There are several components identified in this stage:

a. Curriculum Analysis

The curriculum used in this research is the 2013 Curriculum which focuses on the thematic-integrative approach. Grade 5 students must master eight themes in one school year, which include:

1. Theme 1: Animal and Human Movement Organs
2. Theme 2: Clean Air for Health
3. Theme 3: Healthy Food
4. Theme 4: Health is Important
5. Theme 5: Ecosystem
6. Theme 6: Heat and Circulation
7. Theme 7: Events and Life

8. Theme 8: Environment and our Friends

From this curriculum analysis, it was found that the available teaching materials are still dominant in printed format, and underutilize the potential of digital technology, especially multimodal learning media in *Flip PDF application* research.

b. Material Analysis

At this stage, the review is carried out on the ebook Thematic Teaching Materials for grade 5 SD / MI by analyzing the material on the 8 themes contained in the Thematic Teaching Materials for grade 5 SD / MI to determine the topics and subtopics that will be included in the *Flip PDF application*. Each theme has several basic competencies (KD) that students must master. For example, in Theme 1 (Animal and Human Movement Organs), students must understand the structure and function of animal and human movement organs and the differences between the two. Thus, the development of the application must include visualization of body organs through video, animation, and audio.

Table 2 **Example of Material Analysis Table for each theme:**

Theme	Basic Competency (KD)	Developed Materials	Form of Media to be Used
Theme 1: Animal and Human Movement Organs	Understand the function and structure of animal and human movement organs	Organ structure of animal, human, comparison	Animal organs of motion youtube video (https://youtu.be/JpCZsfpSyrE)
Theme 2: Clean Air for Health	Explain the human respiratory system and its relationship to health.	Human Respiratory System	Video Youtube https://youtu.be/gZFvreUl4R8
Theme 3: Healthy Food	Identifying simple rhythm patterns through folk songs	Functions of human digestive organs	https://youtu.be/Sz3VFN6-MWE
Theme 4: Health is Important	Identify the functions of human digestive organs and their relationship with food and health.	Functions of human digestive organs	https://youtu.be/Sz3VFN6-MWE

c. Analysis of Student Characteristics

Grade 5 SD / MI students are in the concrete operational cognitive development stage, where they more easily understand concepts through visual and interactive representations rather than verbal abstractions. Therefore, the *Flip PDF* multimodal thematic teaching material application is a suitable choice for 5th grade students who generally have good reading and writing skills, so they can take advantage of interactive media that includes text, videos, and images simultaneously. However, they still need strong visual guidance to understand abstract materials such as heat transfer or body organs.

Review of theories related to multimodal teaching materials. (*Flip PDF application)* At this stage all students who are members of the study program research umbrella team get a workshop for 3 days Saturday, June 18, 2022 the first is an explanation of how to make multimodal applications with the *Flip PDF* application. Starting from downloading the *Flip PDF application*, installing, searching for thematic books online. After

that, make a book analysis table containing pages that will be given videos, images or supporting learning media.

Table 3 Example: Book Analysis Table
Grade V Theme 1: Animal and Human Movement Organs

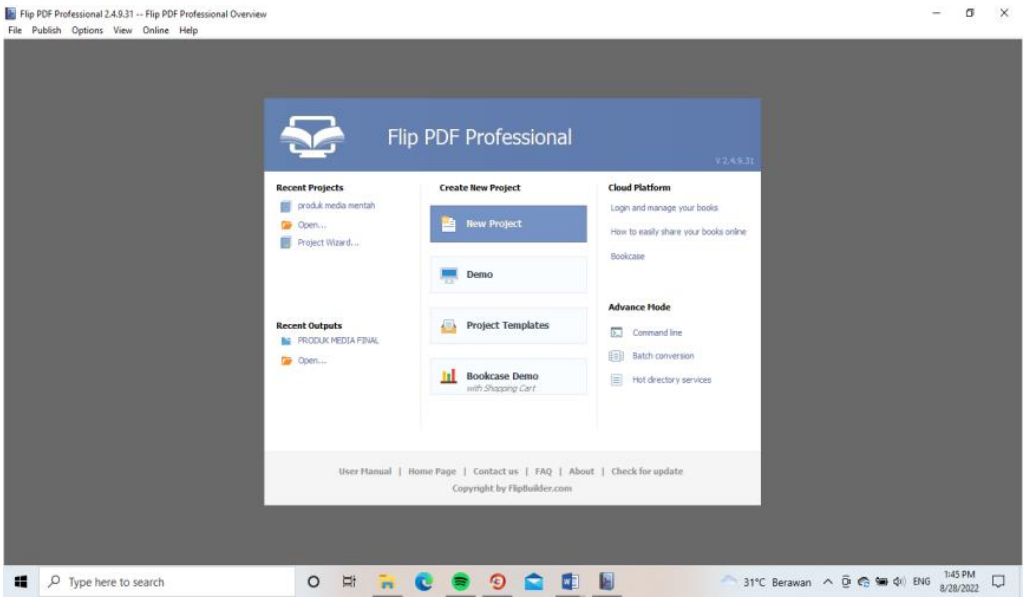
Book Page	Material	Additional
Cover	Teacher/Researcher Welcome	(audio / video)
Instructions Page	Book Instructions	-
1	Animal locomotion organs	Animal organs of motion youtube video
3	Read human and animal organs of motion	Teacher/researcher voice recording
9	Picture story series	Researcher voice recording
10-11	Illustration.	Video youtube
13	Rabbit movement organs	Wikipedia link
14	Animal locomotion organs	Video youtube
16	Fish movement in water	Researcher voice recording

2. Design Stage

Stage *design* or design. At this stage, the application structure design, multimodal content development, and user interface design *(Flip PDF application*) for teaching material applications are carried out.

a. Application Structure Design

On Sunday, June 19, 2022. On the second day of the workshop, the research team was taught a tourorial to enter thematic online books that will be processed into teaching material applications in the *Flip PDF* Application that has been installed. Before entering videos, images , *youtubelinks* ,materials or others, first look for the material that has been described in the book analysis. Furthermore, researchers are taught to enter book analysis data such as videos, images,*YouTube links* and practice questions. If everything is already there, the researcher starts creating a multimodal teaching material application.

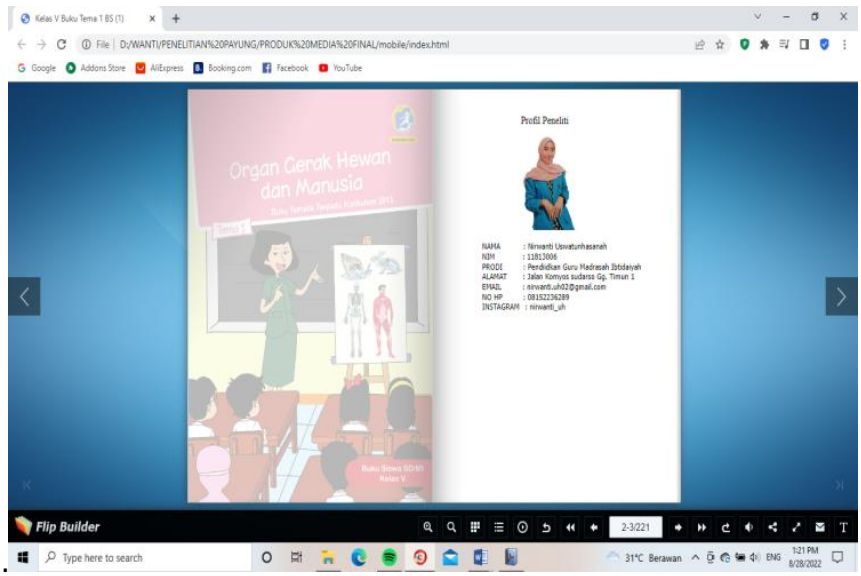


The image above is the Flip PDF application that has been installed which will be included in the theme 1 online book.

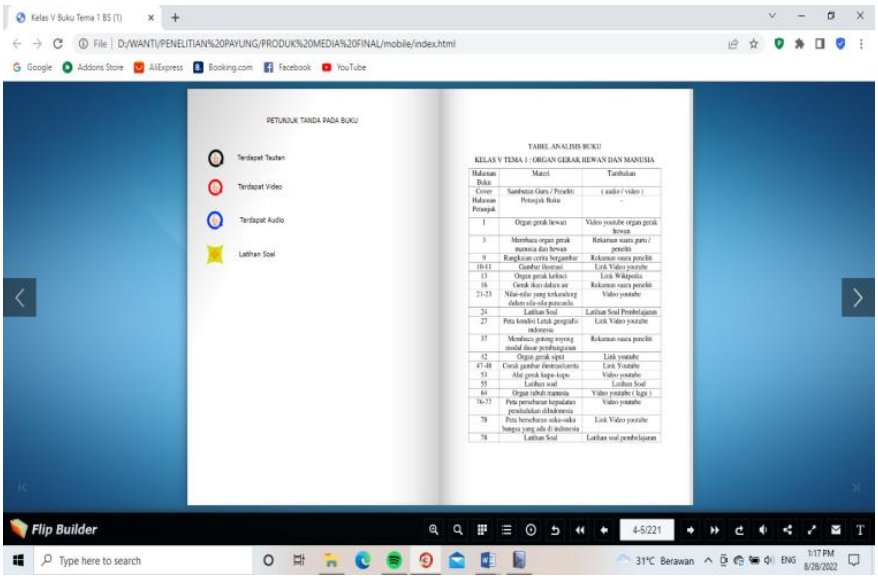
In the picture above the online book has been inserted into the Flip PDF application. Then the process of creating a multimodal teaching material application will begin.

b. Multimodal Content Development

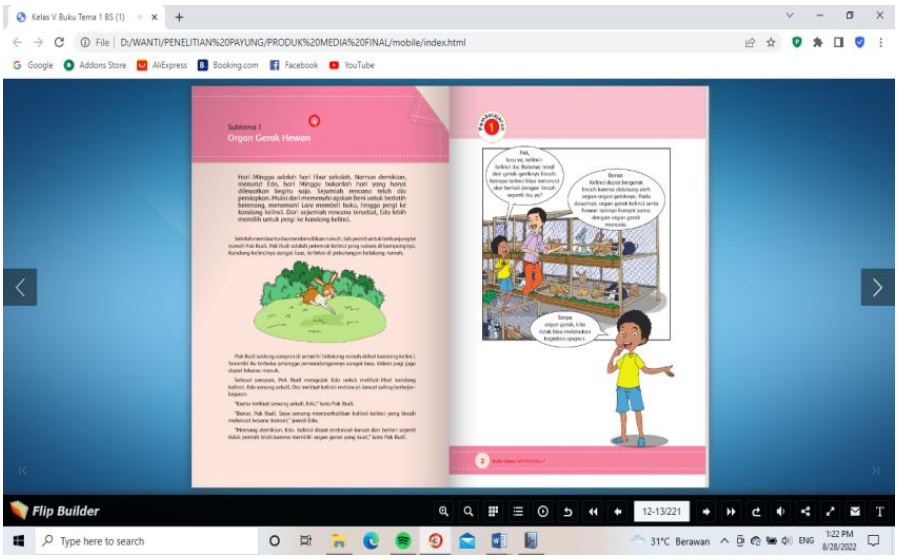
The third day of workshop activities was held on Saturday, June 25, 2022. At this meeting, researchers were asked to show the raw results of multimodal teaching materials before they were made into applications and published. There are several revisions given to improve this application. Then the researcher immediately revised what had been corrected.



The picture above is the researcher profile page



Then proceed with the book mark instructions page and book analysis table to facilitate users of this teaching material application.



On the subtheme start page there is a sign that shows there is a video in it. To open the video, the user only presses the sign contained in the application and then a multimodal teaching material application is published which is ready to be tested for product feasibility validity before testing the practicality and effectiveness of the product in the second stage of development research. This teaching material application can be accessed both in class and at home through electronic devices such as computers, tablets, or smartphones. This application consists of eight thematic modules, where each module corresponds to the learning theme in the 2013 curriculum. Each theme is divided into several subtopics that cover the basic competencies that students must achieve.

Table 4
Application Link for Multimodal Thematic Teaching Materials Based on Grade V Theme 1 to Theme 8

No	Research Team	Teaching Material Theme	Link to Multimodal Thematic Teaching Material Application for Grade V SD / MI
1.	Nirwanti Uswatunhasanah	Theme 1: Animal and Human Movement Organs	https://drive.google.com/drive/folders/1ACmnWfCZ1WUUxjQaHBtqCbBjEAUw5_RU
2.	Yuhaniken	Theme 2: Clean Air for Health	https://mail.google.com/mail/u/0/#inbox/FMfcgzGqPpdvwhcGQdJvKXZhFjdMHnvW?projector=1
3.	Riski Ramadani	Theme 3: Healthy Food	https://drive.google.com/folderview?id=144UgAP7L4Tf14kXMrOUVv4nATqOJQqRA
4.	Tasya Ramadanti	Theme 4: Health is Important	http://drive.google.com/drive/folders/1vYA99PEegGevAY5h81JcjJ2LUME8vL5V?usp=sharing
5.	Aisyah Al Jufri	Theme 5: Ecosystem	https://drive.google.com/drive/folders/1Dl1WFGVcOsso1ec-ILAzdUjKhcdWGqeh
6.	Silvi Yana	Theme 6: Heat and Circulation	https://drive.google.com/drive/folders/1qVJ-HZacxroyTxoddsWXHNIf6vZ9gtTg?usp=sharing
7.	Laely Rahmatika	Theme 7: Events and Life	https://mail.google.com/mail/u/0/#inbox/FMfcgzGqPpdvnSzjSbVwBfBRtjGLTCxJ?projector=1
8.	Husen Hamzah	Theme 8: Environment and our Friends	http://drive.google.com/drive/folders/1_E1X4OH3YxxD3XBrVGf3FDxYo0dxF7fS?usp=sharing

The feasibility test was carried out by three validators, namely Mrs. Maha Lastasa, M.Pd and Mrs. Ricka Tesi Muskania, S.Pd., M.Pd as Lecturers in the Thematic Learning Implementation Course of SD/MI Department of PGMI IAIN Pontianak, and Mr. Mahrani , M.Pd Head of SD Negeri 09 Pontianak Utara who is also a Teacher Facilitator driving the Ministry of Education and Culture Ristek. The purpose of validation is to assess the feasibility of the application, the content of the material and the media contained in the multimodal teaching materials l developed. The instrument used to collect data in this validation process is a closed questionnaire, while suggestions for improvement are open. The results of the feasibility test can be seen in the following table:

Table 5
Application Eligibility Validation Results

No	Validator	Aspek Produk								Penilaian kelayakan Isi materi untuk semua Tema	Kelayakan produk untuk semua Tema
Tema Buku Pendamping		1	2	3	4	5	6	7	8		
1.	Validator 1	4	4	4	3.93	3.93	3.93	3.93	3.93	31.7/8 = 3.96	
2.	Validator 2	4	3.86	3.86	3.86	3.93	3.93	3.93	3.93	31.35/8= 3.91	
Rata -rata skor setiap Tema untuk setiap aspek Penilaian		4	3.93	3.93	3.89	3.93	3.93	3.93	3.93	3.94	Sangat layak
Jlh Sekor untuk 15 Item		60	59	59	58.5	59	59	59	59	59.1	
Jlh Skor Max		60	60	60	60	60	60	60	60	60	
Rata-rata dalam prosentase		100	98	98	97.5	98	98	98	98	98.2 %	Sangat layak

Table 6
Media Eligibility Validation Results

No	Validator	Validator								Rata-rata Penilaian kelayakan Media untuk semua Tema
		Skor Total untu 16 Item Penilaian Pada Setiap Tema								
Aplikasi Bahan Ajar Tema Multimodal Berbasis Androit Buku Pendamping		1	2	3	4	5	6	7	8	
Validator 1	Rata-rata	4	4	4	4	4	4	4	4	32/8 = 4
	Jumlah Skor	64	64	64	64	64	64	64	64	512/8 = 64
Validator 2	Rata-rata	4	3.81	4	3.81	3.81	4	4	4	31.43/8 = 3.93
	Jumlah Skor	64	61	64	61	61	64	64	64	512/8 = 64
Rata -rata skor Penilaian Validator setiap Tema		4	3.91	4	3,91	3,91	4	4	4	31.73/8= 3.97 (Sangat layak)
Jlh Sekor untuk 16 Item		64	62,5	64	62,5	62,5	64	64	64	507.6/8= 63.44
Jlh Skor Max		64	64	64	64	64	64	64	64	512/8= 64
Rata-rata dalam prosentase Etiap Tema		100%	97.6%	100%	97.6%	97.6%	100%	100%	100%	792.8/800= 99 % Sangat layak

Table 7
Results of Validation of Material Content Eligibility

No	Aspek	Indikator	Buku Aplikasi Bahan Ajat Tematik Multimodal								Rata- Rata
			1	2	3	4	5	6	7	8	
1.	Materi Pembelajaran	Validator 1	4	4	4	4	4	4	4	4	4
		Validator 2	4	3.75	3.75	3.75	3.75	4	4	4	3.87
2.	Strategi Pembelajaran	Validator 1	4	4	4	4	4	4	4	4	4
		Validator 2	4	3.67	3.33	3.33	3.33	4	4	4	3.71
3.	Efesiensi	Validator 1	4	4	4	4	4	4	4	4	4
		Validator 2	4	4	4	4	4	4	4	4	4
4.	Kualitas Teknis dan Keefektifitas Media	Validator 1	4	4	4	4	4	4	4	4	4
		Validatir 2	4	3.67	3.67	3.67	3.67	4	4	4	3.84
5.	Kualitas Teknis dan Keefektifitas Media	Validator 1	4	4	4	4	4	4	4	4	4
		Validator 2	4	4	4	4	4	4	4	4	4
	Skor Rata-rata Penilaian Validator setiap Tema		4	3.9	3.87	3.87	3.87	4	4	4	3.94 Sangat Layak
	Jumlah Skor penilaian Setiap Tema		64	62.5	62	62	62	64	64	64	63
	Jumlah Sekor Max Setiam Tema		64	64	64	64	64	64	64	64	64
	Peorsentase capaian		100%	97.7%	96.8%	96.8%	96.8%	100%	100%	100%	98.5 %

Based on the results of the assessment of media experts above, it can be concluded that the multimodalteaching materials developed are suitable for use in learning. In general, media experts advise some of the following. (a) Balance the composition between text, images, video, and animation; (b) colour composition should not be too crowded as it may accelerate eye fatigue, and (c) it is necessary to explore more deeply the use of Sway applications.

In addition to providing suggestions for improvement, learning media experts convey the advantages of this multimodall teaching material, including (a) being able to provide deeper and varied material compared to textbooks, (b) the use of the 3DPageFlip application which can be downloaded with a computer, laptop, or android allows students to learn it even though it is not connected to the internet, and (c) Multimodal teaching materialsl It can be used again on learning at another time with or without refinement.

Based on the results of the feasibility test of learning experts and learning media experts above, it can be concluded that multimodal l teaching materials developed materially are suitable for use in learning.

D. Dicsuusion

This research developed a multimodal thematic teaching material application for grade 5 SD/MI, focusing on eight main themes adapted to the 2013 Curriculum. At the define and design stages, several important findings emerged that underlie the development of this application

1. Discussion of the Define Stage.

The define stage focuses on defining problems and needs in thematic learning in grade 5 SD/MI. The results of analyzing the curriculum, teaching materials, and student characteristics provide a clear picture of the challenges and potential that exist in the development of technology-based teaching materials.

a. Curriculum Analysis.

Curriculum analysis revealed that the thematic curriculum in grade 5 integrates various subjects into one theme that is relevant to students' daily lives. Thematic learning in general aims to develop thinking skills and the growth of students' positive character and behavior (Lestari et al., 2023). However, the main challenge that arises is the lack of utilization of technology in presenting materials that support blended based learning. These results indicate that there is a great opportunity to develop IT-based teaching materials that integrate different types of media to help students better understand the concepts presented.

Curriculum 2013 is oriented towards a thematic-integrative approach. Thematic learning offers a way to integrate students' interests with core skills to motivate them to do academic activities they do not like (Wardani et al., 2020). The 2013 Curriculum is a government initiative aimed at reforming Indonesia's education system. It emphasizes student-centered learning, focusing on developing character and competency in an integrated and holistic manner. The 2013 Curriculum prioritizes competence by emphasizing attitude, knowledge, and skill-based thinking. In the teaching process, teachers are required to address all specified aspects comprehensively (Sari, 2021). But in practice, teaching materials are still dominated by conventional printed materials. The use of print media alone tends to be less attractive to students in the digital era who are accustomed to visual and interactive technology. Therefore, the results of this analysis support the importance of developing technology-based teaching materials with multimodal media to increase students' interest and motivation to learn.

b. Material Analysis

In the material analysis, it was found that each theme has several basic competencies that students must master, but the current materials do not support visual and interactive learning. For example, on the theme of animal and human movement organs, the available materials are text and two-dimensional images only, which may be difficult for students to understand in visualizing the function of movement organs.

This finding reinforces the need to develop multimodal teaching materials, where visual media such as videos, animations, and interactive diagrams can help explain the material more clearly. Mayer (2009) through the *Cognitive Theory of Multimedia Learning* also states that the integration of text and visuals improves students' learning ability because it provides a stronger mental representation**.**

c. Analysis of Student Characteristics

Analysis of the characteristics of grade 5 students shows that they are at the concrete operational stage of cognitive development. They need visual and interactive support to understand abstract concepts. From observation, students at this age have different learning preferences, such as visual, auditory, and kinesthetic, which emphasizes the importance of developing teaching materials that can be accessed through various modalities.

Grade 5 students also show more enthusiasm when dealing with interactive and digital learning media, which supports the finding that multimodal teaching materials can help increase student engagement in the learning process. In this case, the development of teaching materials applications with interactive features such as quizzes and

simulations would be very effective.

2. Discussion of the Design Stage

After defining the needs at the define stage, the design stage focuses on designing multimodal thematic teaching material applications that are in accordance with the characteristics of students and the learning materials needed. This application design includes application structure planning, multimodal-based content development, and intuitive user interface design. Istiqomah et al. (2023)**,** states that Instructional materials presented systematically, using understandable vocabulary, attractive layouts, and illustrations or images related to the subject matter, can encourage students to engage in active, independent learning.

a. Application Structure Design.

The structure of the designed application consists of eight modules, where each module corresponds to the learning theme set in Curriculum 2013. Each module has subtopics divided according to basic competencies, and in each subtopic various types of learning media are provided such as videos, animations, and interactive simulations. The decision to divide the application into eight modules based on themes aims to facilitate student navigation in choosing the learning material they want to learn. This structure also makes it easier for teachers to integrate the app into face-to-face and online teaching and learning activities.

The addition of interactive features such as quizzes and simulations in each module is also designed to allow students to test their understanding independently. Quiz results will provide immediate feedback to students, which serves as a form of formative evaluation to support personalized learning.

b. Multimodal Content Development.

The content developed in this application uses a multimodal approach, where each material is presented through different types of media. This approach is in line with Mayer's (2009) findings that presenting information through more than one modality (e.g., text and images, or text and video) is more effective in improving student understanding compared to presenting only one modality.

An example of the developed content is the visualization of the heat transfer process through animation, which helps students understand abstract concepts such as convection, conduction, and radiation. By seeing the heat transfer simulation directly, students can more easily relate the theory to the reality they experience in their daily lives.

In addition, audio-based content is also used to help students with auditory learning styles. The narration that accompanies videos or images aims to explain important concepts in a language that is easily understood by students.

The user interface design is designed to be easy to use by students of different ages and technological abilities. The use of visually appealing icons and intuitive navigation is expected to facilitate the use of the app by students without too much guidance from teachers or parents. By leveraging technology, students can retain science concepts more effectively, as visual and interactive components strengthen their understanding over time. Consequently, incorporating technology into science education not only enriches students' learning experience but also supports their academic growth and cognitive abilities (Setyaningrum et al., 2023).

The results of the user interface design show that students get used to applications that have a simple but functional design more quickly. The use of bright colors adapted to the world of children also helps to create a friendly and fun atmosphere. In addition, large and clear navigation buttons make it easy for students to access learning materials or evaluate through quizzes.

The designed interface also considers accessibility features, such as adjustable text size and the use of narration to help students with reading difficulties. This shows that the design of the app not only aims to enhance the learning experience of advanced students, but also to help students who may need additional support.

E. CONCLUSION

Based on the above explanation, it can be concluded as follows: (1) The development of teaching materials carried out in the first phase of development research has been carried out through several stages involving an umbrella research team facilitated in workshops so that the process of making the product becomes directed and revisions are made directly at the Workshop stage, so that the Multimodal Teaching Material Application Product with the Flip PDF Application. (2) Based on the results of the trial, it is known that the multimodal teaching materials developed are concluded to be in the category of very feasible as a result of the Teaching Material Application Product.

The products developed of course still require further development, therefore the researcher suggests conducting a second phase of research to test the practicality and effectiveness of this application at school in a limited location and expanded so that improvements can be made so that finally it can be used as a teaching material that can be used in SD / MI both as a learning resource for students..

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