

Interactive Multimedia Development of Indonesian Endemic Plants: Species Uniqueness with MDLC Approach

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ABSTRACT

Keywords: interactive multimedia, endemic plants, MDLC, media development, interactive learning.

This research explores the development of interactive multimedia with a focus on Indonesia's endemic plants, applying the Multimedia Development Lifecycle (MDLC) as a design approach. MDLC provides a systematic foundation with six related phases, including concept, design, material collection, assembly, testing, and distribution, to ensure the success of educational media development. The hardware and software required for multimedia creation are also outlined, providing a comprehensive overview of the technology infrastructure used. Design steps include concepts that consider visual uniqueness, intuitive navigation, deep content, and connectivity to learning needs. The storyboard design breaks down into sections, including splash screens, main menus, material menus, evaluations, and information, each designed to provide an optimal user experience. Material collection involves selecting multimedia assets, including images, letters, and icons, integrated using Adobe Illustrator software. The assembly process is carried out through Construct 2, creating an interactive and dynamic interface. Black Box testing is conducted to verify compliance with optimal design and functionality. Supporting theories, such as multimedia concepts, MDLC, and the definition of Indonesia's endemic flora, provide a strong theoretical foundation. Results and discussions include evaluations of Alpha and Beta testing that show positive user responses. Overall, this research concludes that interactive multimedia successfully provides an effective and engaging learning experience, ready for widespread distribution.



Introduction

The latest technological advances are the main factors supporting the renewal efforts. The role of technology is very important, especially in society in developing countries (Mertayasa & Pascima, 2024). The government and the public are very concerned about the current technological developments because they realize that the role

and function of technology are very important for life. The presence of modern technology in the field of communication has affected all fields, including education (Novita & Harahap, 2020).

Media is an inseparable part of the learning process because educational goals can be achieved through media. One of the media that keeps students engrossed in learning is interactive multimedia content, such as PowToon-based themed learning. PowToon-based interactive multimedia in class V theme learning has been validated by material experts, linguists, and media experts (Pratiwi, 2021). Therefore, it is suitable for use in theme learning. PowToon-based interactive multimedia proved to be very practical when tested to students and teachers. Practicality is tested in small group experiments and field tests. Based on the results of the pre-test and post-test, PowToon-based interactive multimedia content is suitable for use in thematic learning in class V because it can have a significant impact (Donna, Ekok, & Febriandi, 2021).

Interactive multimedia is a combination of various media (file formats) in the form of text, images (vectors or bitmaps), graphics, sounds, animations, videos, interactions, etc., used to convey messages packaged in digital files (computerized) and used for general use (Albani, Rachman, & Kurniawan, 2022).

Previous work on interactive multimedia content was carried out by (Rejekiningsih, Budiarto, & Sudiyanto, 2021) The results of this research and development are interactive multimedia products based on local potential which is a learning media innovation as well as an overview of the feasibility of interactive multimedia products developed. Further research by (Sama & Fransisco, 2022) This research aims to create an augmented reality endemic plant AR application that will help introduce endemic plants to grade 4 students of SDN 03 Siddadi.

In an effort to develop a multimedia-based learning system, it is necessary to apply a methodology that is in accordance with the needs of the system. One of the relevant approaches is to involve the Multimedia Development Life Cycle (MDLC) development model. In this method, there are six stages that must be passed, namely Concept, Design, Material Collection, Assembly, Testing, and Distribution (Lee & Herman, 2023).

MDLC is a technology that combines the real-world dimension with the virtual world dimension that is displayed in real time, in contrast to virtual reality which only adds to or complements what exists in the real world, not completely replaces it. MDLC specifically refers to applications related to multimedia and is currently widely used in research related to multimedia and mobile applications (Mazda & Fikria, 2021).

Indonesia is a country with a very diverse diversity of flora and fauna, from Sabang to Merauke. Indonesia's amazing diversity of flora and fauna is due to its geographical location located near the equator and stretching across the islands of Indonesia (Wardana, Ramadhan, Aznur, Putri, & Ikhwan, 2023).

Due to the lack of material innovation, the opportunity to introduce children to plants and animals is still considered low. Education that introduces children to flora and fauna is very important to preserve the existence of flora and fauna in Indonesia (Wardani, 2020).

Based on the above research, the author designed a learning media about endemic flora with the aim of getting to know the diversity of endemic flora and how to make interactive multimedia-based learning media using construct 2 to find out how to apply the methods used.

Research Methods

Research Stages

In designing a multimedia-based learning system, the Multimedia Development Lifecycle (MDLC) methodology is used as an appropriate approach for learning media design. MDLC, as a tested and structured design method, provides a comprehensive framework to oversee every stage of learning media system development. This methodology consists of six interrelated phases, namely the Concept, Design, Data Collection, Assembly, Testing, and Distribution phases, which are designed to ensure success in producing effective learning media and in accordance with the desired learning objectives, in line with the quality standards and timeliness required in the context of this research (Ambarwati & Darmawati, 2020).

Here are the tools needed to make learning media:

Table 1
Hardware

Name	Information
OS	Windows 11 64-bit
Processor	AMD Ryzen 5 5500U with Radeon Graphics
RAM	8.00 GB
Storage	512 GB

Table 2
Software

Name	Information
Adobe Illustrator	Asset editing software
Google Chrome	Looking for the assets needed to create learning media
Construct 2	Software used to design and design learning media

In designing interactive multimedia of Indonesia's endemic flora, the following are the stages:

a. Concept

In order to succeed in the development of interactive multimedia focusing on Indonesia's endemic plants, it is necessary to consider a number of critical criteria, including attractive visual distinctiveness, intuitive navigation, in-depth and informative content, and a close connection to the needs of the learning process.

b. Design

The next stage will lead to the creation of storyboards, which are based on the concepts that have been obtained in the previous stage in this research. The storyboard design process will be articulated into several segments, including detailed visualizations, interactive navigation settings, and the incorporation of multimedia content. It aims to ensure the development of interactive multimedia that is not only informative but also facilitates engaging and structured learning.

c. Material Collection

The author will collect a number of essential materials to support the design of this learning media. This process involves the search and selection of information sources, including text, images, and multimedia elements that are relevant to content about Indonesia's endemic plants

d. Perakitan

The incorporation of design elements for learning media about endemic flora is realized through the use of Construct 2 software. By utilizing this platform, authors compose and put together various visual elements such as images and illustrations, audio elements including backgrounds and sound effects, and navigation buttons.

e. Testing

The designed learning media will undergo testing using the Black Box method to verify the suitability of the content with the established storyboard. In addition, testing will also focus on its functionality on the platform in question, by ensuring that the application can run smoothly. All buttons in the app will also be tested to ensure good functionality, so that users can access and interact with learning content optimally.

Results and Discussion

The results arising from the application of the MDLC method in the development of interactive multimedia for endemic plants can be achieved through a series of research stages that have been carried out. The details of the steps that have been taken in this study include:

Concept

In this step, the researcher designs the concept of the system flow in a short and easy-to-understand way. This is so that the system can help in counseling about endemic plants to the community at large.

Planning

This design step produces a research plan using the program structure, UML, and system design as an overview of how the system will be implemented. Here are the details for the program structure design, UML, and system design:

1. Program Structure

The following is the program structure of an interactive multimedia system that delves into endemic flora:

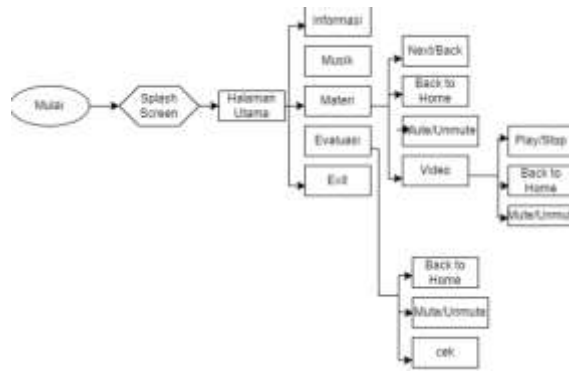


Figure 1. Structure of the Endemic Flora Interactive Multimedia Program

UML Design

In the development of interactive multimedia about endemic flora, the application of UML is carried out as a means of providing visual modeling languages or graphic representations for users with various programming backgrounds or in the context of general engineering. The types of diagrams used are as follows:

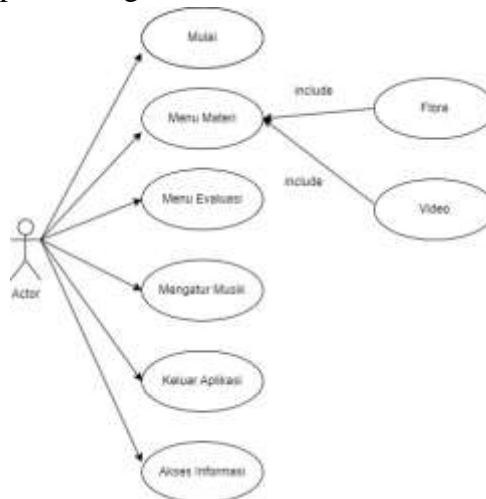


Figure 2
Use Case Diagram Multimedia Interaktif Flora Endemic

Figure 4 shows a use case diagram of an interactive multimedia being developed, which provides an overview of the interaction between the user and the system. In this interactive multimedia, there is one involved party (actor) and six main use cases, as well as two use cases included in the material menu, such as use cases for flora and video. Next, the next UML diagram is a sequence diagram as shown in figure 3.

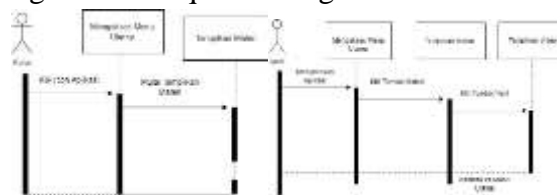


Figure 3. Sequence Diagram

Sequence diagrams play a role in explaining and visualizing the interactions between objects in a system in detail. In the context of this interactive multimedia, there are two sequence diagrams, where the first sequence diagram depicts the user's interaction when starting the application. The second sequence diagram illustrates user interaction when running the application.

An Activity Diagram will illustrate the activities or processes that can be performed by the system, not just the actions performed by the actors. Therefore, this diagram will highlight the activities that the system can perform. In the context of interactive multimedia that is being developed, there are eight activities that can be carried out by users. Starting from displaying the main page, displaying evaluations, displaying material in the form of text or video, to returning to the main menu.

Design Perancangan Program

Program planning plays an important role in the development of interactive multimedia. From this design, a guide was generated regarding the display and layout of the menu and content that will be displayed on the interactive multimedia that is being developed.

The main page is designed with a clean and responsive layout, featuring a variety of functional buttons for easy user navigation. There is an "Information" button that provides access to more information or instructions related to the application, as well as a "Mute/Unmute" button to control the sound or music that accompanies this interactive multimedia.

In addition, there is a "Material" button that allows users to explore the content or materials presented in multimedia. The "Evaluation" button provides direct access to the evaluations or quizzes integrated in this app, allowing users to gauge their understanding. Finally, there is an "Exit" button that gives you the option to exit the app. This design aims to provide an intuitive and enjoyable user experience, making it easy for users to explore and interact with the various features provided.

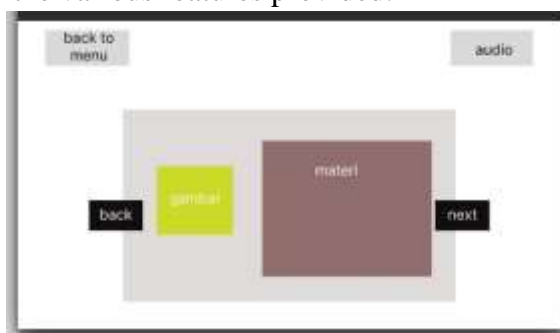


Figure 4. Material Page Design

The material menu page is designed with an attractive and informative layout, featuring a "Back to Home" button to return to the main page, a "Mute/Unmute" button to control the sound, and a "Next/Back Material" button for content navigation. The material is accompanied by pictures, providing an interactive learning experience and attractive visuals.

The information button is created to provide the user with information about the developer when clicked. The window that appears contains the identity of the developer, namely, photo, name, and study program.

Once the user enters the answer, they can click on the "Check" button to instantly know if their answer is correct or not. This design provides a quick and clear interactive experience, making it easy for users to participate and get immediate feedback on the answers they provide.

Material Collecting

In endemic flora research, the process of gathering material involves retrieving assets from external sources, such as Google, that fit into the context of the endemic flora being studied. Once the assets are acquired, the next step is to separate and merge them using Adobe Illustrator (Freepik, 2024).



Figure 5. Set assets in adobe illustrator

In the early stages, the assets obtained from Google were processed and separated using Adobe Illustrator to customize and optimize their functionality in the interactive multimedia of endemic flora. Using this technique, the assets can be rearranged and adjusted to better suit the needs of the research.

Perakitan

In this step, the researcher designed interactive multimedia as best as possible in order to convey information about endemic flora to users. Here are the results of the assembly process:



Figure 6. Interface Splash Screen

When you open the interactive multimedia, the initial experience will be preceded by a splash screen page display displaying the title of this multimedia, which is "Flora

Endemic." This page is designed to give an interesting first impression and immediately focus the user's attention on the uniqueness and diversity of endemic flora that will be explored in the interactive content.

The main menu page presents a variety of features that include information about the developer's profile, allowing users to explore further. In addition, there is a music setting button to turn the music on or off according to the user's wishes. There is also a material menu button that facilitates access to various informative content, as well as an evaluation option to measure user understanding. Lastly, an exit button is provided to provide an option to exit the app easily. The design of this page is designed to provide an intuitive user experience and a wide range of features that support convenient interactive multimedia exploration.

The information page is designed as an access point to get to know more about the developer profile behind this interactive multimedia. With the presence of photos that depict the developer's face and expressions, users can feel more personally connected. The name of the developer along with the study program (study program) that is followed provides more detailed information about the academic background and expertise that can enrich the user's understanding of the resources they use.

The material page presents rich informative content about Indonesia's endemic plants, complementing the material with real images that enrich the user's visual experience. Each material is comprehensively designed to provide an in-depth understanding of the uniqueness and diversity of Indonesia's endemic flora, creating an informative and engaging learning experience.

In this video material, a more detailed explanation of endemic plants will be given. Through this video, it is hoped that users can gain a deeper understanding related to its characteristics, uniqueness, and distribution. The existence of this video material is expected to increase user understanding of the material presented, creating a more interactive and informative learning experience.



Figure 7. Evaluation Interface

The evaluation feature on this interactive multimedia is designed through a guessing format, where users will be shown a picture. After that, they can input an answer in the form of the name of the endemic flora described. Through the press of the "Check" button, the results of the evaluation of the user's answer will appear immediately, providing instant feedback on whether the answer is correct or incorrect. The design aims to enrich

the user's learning experience in an interactive way and provide an opportunity to test their knowledge of Indonesia's endemic flora.

Testing

In this phase, researchers will run two types of tests, namely Alpha testing carried out by the researcher himself, and Beta testing that involves direct user participation.

Alpha Testing

In this testing stage, the researcher will evaluate the visual aspects and functionality of each button contained in the venomous animal interactive multimedia, as listed in Table 1.

Table 3
Alpha Testing

No	Komponen yang diuji	Skenario Pengujian	Pengujian	Keterangan
1	Menu Utama	Memilih Tombol "Informasi"	BlackBox	✓ Berhasil
		Memilih Tombol "Musik"	BlackBox	✓ Berhasil
		Memilih Tombol "Materi"	BlackBox	✓ Berhasil
		Memilih Tombol "Evaluasi"	BlackBox	✓ Berhasil
		Memilih Tombol "Exit"	BlackBox	✓ Berhasil
2	Materi	Memilih Tombol "Home"	BlackBox	✓ Berhasil
		Memilih Tombol "Musik"	BlackBox	✓ Berhasil
		Memilih Tombol " Previous"	BlackBox	✓ Berhasil
		Memilih Tombol "Next"	BlackBox	✓ Berhasil
		Memilih Tombol "Video"	BlackBox	✓ Berhasil
3	Video	Memilih Tombol "Home"	BlackBox	✓ Berhasil
		Memilih Tombol "Musik"	BlackBox	✓ Berhasil
		Memilih Tombol "Play"	BlackBox	✓ Berhasil
		Memilih Tombol "Pause"	BlackBox	✓ Berhasil
		Memilih Tombol "Home"	BlackBox	✓ Berhasil
4	Evaluasi	Memilih Tombol "Musik"	BlackBox	✓ Berhasil
		Memilih Tombol "Previous"	BlackBox	✓ Berhasil
		Memilih Tombol "Next"	BlackBox	✓ Berhasil
		Memilih Tombol "Cek"	BlackBox	✓ Berhasil
		Memilih Tombol "Keluar"	BlackBox	✓ Berhasil
5	Informasi	Memilih Tombol "Keluar"	BlackBox	✓ Berhasil

From the data contained in Table 1, five test sessions were carried out on each feature available in the interactive multimedia. Every component successfully operates smoothly without encountering errors.

Beta Testing

In the beta test, after 30 respondents fill out a Google form, the data from the questionnaire will be analyzed using the beta test method to evaluate the effectiveness of the interactive multimedia that has been developed. There are 14 assessment indicators with five levels of assessment, namely: 1 = very bad, 2 = not good, 3 = not good, 4 = quite good, 5 = very good. For example, on the indicator "Attractive and satisfying multimedia visual display"

In figure 19, it can be seen that the measurement results for assessment indicator 1, where out of 30 respondents, 18 gave very good assessments, 12 gave quite good assessments, while no respondents gave poor assessments, bad assessments and very bad assessments. Therefore, when calculated in terms of ratings, the results are as follows:

Distribution

After the evaluation stage is complete, the application is ready for publication. The distribution process can be done through a link on the website and using storage media such as a usb drive, so that it can be easily accessed by users.

Conclusion

This research succeeded in developing interactive multimedia focusing on endemic plants in Indonesia with the Multimedia Development Lifecycle (MDLC) approach. The MDLC methodology is used as a structured framework, involving six related phases, namely concept, design, material collection, assembly, testing, and distribution. Involving detailed hard and soft tools, this study describes the process of creating interactive multimedia about Indonesia's endemic flora, which is piloted through Alpha and Beta testing. The test results showed a positive response from users, with an average score of 4.74 out of a scale of 5. Thus, the conclusion of this study confirms that the interactive multimedia developed is able to provide an effective and enjoyable learning experience around the uniqueness of Indonesia's endemic plant species. The distribution of this media can be done extensively through website links and storage media, ensuring optimal accessibility for users interested in exploring Indonesia's endemic plant diversity.

Bibliography

- Albani, Salmaan Daffa, Rachman, Anung, & Kurniawan, Rendya Adi. (2022). Perancangan Animasi 2d Edukasi Pengenalan Flora Dan Fauna Di Indonesia. *Jurnal Muara Ilmu Sosial, Humaniora, Dan Seni*, 6(3), 599–605. <https://doi.org/10.24912/jmishumsen.v6i3.18809.2022>
- Ambarwati, Putri, & Darmawel, Putri Syifa. (2020). Implementasi multimedia development life cycle pada aplikasi media pembelajaran untuk anak tunagrahita. *Majalah Ilmiah UNIKOM*, 18(2), 51–58.
- Donna, Rama, Egok, Asep Sukenda, & Febriandi, Riduan. (2021). Pengembangan multimedia interaktif berbasis powtoon pada pembelajaran tematik di sekolah dasar. *Jurnal Basicedu*, 5(5), 3799–3813.
- Lee, Calvin, & Herman, Herman. (2023). Penerapan Metode Mdlc Dalam Pengembangan Media Pembelajaran Augmented Reality Untuk Mengenal Jenis-Jenis Sambal Indonesia. *Jurnal Pendidikan Teknologi Informasi (JUKANTI)*, 6(2), 272–284.
- Mazda, Chadziqatun Najilatil, & Fikria, Alfa Nahdlijatul. (2021). Analisis Efektifitas Google Classroom, Zoom Meeting dan Google Meet sebagai Multimedia Interaktif Pembelajaran Online. *Journal of Informatics Information System Software Engineering and Applications (INISTA)*, 3(2), 1–9.
- Mertayasa, I. Nengah Eka, & Pascima, Ida Bagus Nyoman. (2024). Pengembangan Augmented Reality Pengenalan Tanaman Langka Endemik Indonesia Bagian Barat. *KARMAPATI (Kumpulan Artikel Mahasiswa Pendidikan Teknik Informatika)*, 13(1), 32–43.
- Novita, Rini, & Harahap, Syaiful Zuhri. (2020). Pengembangan media pembelajaran interaktif pada mata pelajaran sistem komputer di SMK. *Informatika*, 8(1), 36–44.
- Pratiwi, Putu Ayu Rossy. (2021). *Pengembangan Multimedia Interaktif Ceria Pada Muatan Materi Kenampakan Alam Serta Flora Dan Fauna Indonesia Kelas V Di Sdn 5 Pedungan*. Universitas Pendidikan Ganesha.
- Rejekiingsih, Triana, Budiarto, Mochamad Kamil, & Sudiyanto, Sudiyanto. (2021). Pengembangan multimedia interaktif berbasis potensi lokal untuk pembelajaran prakarya dan kewirausahaan di SMA. *Kwangsan*, 9(2), 498082.
- Sama, Hendi, & Fransisco, Jecky. (2022). Pengembangan Dan Implementasi Video Pembelajaran Mata Pembelajaran Geografi Di Sma Kartini Batam Menggunakan Frame Work Multimedia Development Life Cycle (MDLC). *National Conference for Community Service Project (NaCosPro)*, 4(1), 940–945.
- Wardana, Aji, Ramadhan, Muhammad Rizky, Aznur, Mahzura, Putri, Rizka Annisa, & Ikhwan, Ali. (2023). Media Pembelajaran Multimedia Interaktif Menggunakan Metode MDLC Pada Zoom Meetings. *Jurnal Penelitian Dan Pengkajian Ilmiah*

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Eksakta, 2(1), 25–29.