

Creating an Interactive E-book with Augmented Reality for Android Devices

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ABSTRACT

Today's students, both school and school children, tend to seek information from smartphones rather than printed books or newspapers, take notes on their lessons on their smartphones and rarely use notebooks, and even do assignments using smartphones rather than computers or laptops. The problem faced by this study program is the limited teaching materials available, especially for the Green Business course. Currently, students need more visual teaching in order to understand the material well. This study aims to develop an Android-based electronic flipbook with augmented reality technology that is valid, practical, and able to improve student learning outcomes effectively. The research method used was a practicality test, and the results indicated that the developed e-book falls into the highly practical category.

INTRODUCTION

Surveys show that, in reality, the reading culture in Indonesian society is currently declining. According to Zuhria (2022), one of the contributing factors is the habit of using gadgets. Unlimited access to various information, entertainment, and games causes interest in reading to decline because it is considered less interesting. The problem in this study program is the lack of open materials available in the courses held. One of the compulsory courses held is Green Business. This course aims to provide knowledge and experience for students regarding the importance of entrepreneurship based on environmental sustainability. Becoming an entrepreneur is not just about seeking profit but also having to consider the environment (Rinawati & Setiawan, 2020). This course is very interesting and is already an applied course because at this stage students have entered the entrepreneurial phase of making a profit and protecting the environment. However, until now there have been no books or open materials owned by lecturers in teaching this course. If searched from other places, the Green Business book is still rare and very rare to find. Therefore, the creation of a Green Business book needs to be done so that lecturers have guidelines in implementing learning in the classroom.

To overcome these problems, it is necessary to create a digital book (e-book) that includes videos that can be accessed offline, case study articles, and scientific journals. Lecturers can also add quiz links that allow students to take quizzes and get results that can be corrected automatically. This e-book model is known as Flipbook. Flipbook is an electronic media that integrates animation, text, video, images, audio, and navigation, making the learning process more interactive and interesting for students (Widyasari, 2021).

In addition, the images in the book need to be presented in a more realistic format (3D) so that students can experience the moving images directly. This 3D-based book is known as Augmented Reality. Augmented Reality (AR) is a technology that integrates 2D or 3D virtual objects with the real world in real-time (Aditama, 2019). The combination of flipbook-based e-books with augmented reality is an ideal solution to increase the availability of textbooks in the Green Business course. This e-book will also be designed for the Android platform, so students can access it directly through their smartphones. The goal is to create an Android-based electronic flipbook (e-Book) with augmented reality technology for the Green Business course that is effective, practical, and can improve student learning outcomes.

Based on the background above, the researcher is interested in conducting research with the title "Developing an Interactive E-book with Augmented Reality on Android Platform". Ultimately, it is hoped that making this e-book can improve student literacy and learning outcomes.

THEORETICAL REVIEW

Electronic Flipbook

E-book (Electronic Book) is a book publication available in electronic form, consisting of text, images, or both. With the presence of e-books, it will be easier for users because they can be downloaded and saved on their respective smartphones. Today, e-books come with various technological features. If so far

e-books are just electronic versions of printed books, but with the increasingly massive development of technology, e-books come with various sophisticated features.

This text is able to concretize learning topics that are difficult to understand, making them more real and easier for students to digest, so it is very different from e-books in general which only contain text and image content in them (Tuazmi, 2022). In flipbooks, learning videos can be included that can be accessed offline. Not only videos, flipbooks also have a sound feature, if users want to listen to the contents, they can click on the sound feature (Wicaksono, 2021). In addition, flipbooks can also include links to case study articles, scientific articles.

Augmented Reality Book

Augmented Reality (AR) is a technology that allows the integration of two-dimensional or three-dimensional visual objects with the real environment directly and in real time (Syarifuddin, 2022 ; Rosyada, 2023). Through this technology, an object that previously could only be seen in two dimensions can appear as a virtual object that is combined in the real environment in real time.

A barcode will be displayed on the book and when the barcode is scanned, a 3D-based image display will appear. The images that appear will look more visually real and no longer abstract. This will make it easier for students to understand the learning material they are reading. The weakness of learning so far has been the abstract explanation so that students cannot understand the lesson completely.

Student Learning Outcomes

Reading is an activity that needs to be improved because the core of the entire learning process is reading. Based on the List of Final Grade Students for the 2021 C grade standard, out of 33 students, only 8 got an A, 16 got a B, and 9 got a C. This condition shows that student learning achievement is still relatively low. Learning outcomes are greatly influenced by reading literacy. The more you read, the higher the knowledge you get, and learning outcomes will also increase. Therefore, learning outcomes need to be optimized by providing visual and interesting teaching materials or books for students.

Compilation of Android-Based Electronic Flipbook (E-Book) with Augmented Reality Technology

Books are the main element in the learning process (Zakaria dkk, 2023). Making flipbook-based books and augmented reality is still rarely done by researchers. Some have made flipbook-based books or augmented reality separately, but the combination of these two technologies has not been widely explored. This study aims to combine the two technologies to produce a more sophisticated book. The resulting e-book will be registered on Playstore (Android-based), so that it can be accessed either via laptop or smartphone. Providing Android-based e-books is very important considering the shift in student learning habits from the past to the present. Millennial generation students tend to prefer learning and reading via their smartphones, so this e-

book is specifically designed for the Android platform (Yuhanto & Miyosa, 2022). Thus, this e-book can be accessed anytime and anywhere.

METHODOLOGY

Research Model

This research is a Research and Development (RnD) research using the Plomp model. This model consists of five phases, namely:

1. Preliminary Investigation

This stage, also known as situation analysis, involves assessing the problems in the field:

- a. Needs Analysis: Needs analysis is carried out to identify what is needed to support learning in the Green Business course. This analysis is carried out through interviews with lecturers and students.
- b. Learning Obstacle Analysis: Learning obstacles faced during the learning process are analyzed. The information obtained from this initial investigation stage will be the basis for determining the right solution to overcome the problem.

2. Design

- a. Data Design: At this stage, the design of the Green Business e-book content is carried out, including the preparation of course outline, topic selection, learning videos, journals, and others. In addition to designing the e-book, book assessment instruments such as validity and practicality questionnaires are also designed.
- b. Navigation Design: Flipbook is planned to use 3D Pageflip software, while augmented reality technology will be developed with Asemblr App. Android-based e-books will be designed using Corel Draw and Android Studio.
- c. User Interface Design: At this stage, the initial menu and main menu are designed. The initial menu is the front view of the e-book that appears after the loading process, while the main menu appears after the menu button on the home page is clicked. The main menu contains four buttons that lead to pages such as profile, learning objectives, learning materials, and evaluation.

3. Realization/Construction

At this stage, prototype I (initial) is created as a result of the design stage. All planning from the design stage will be implemented. The resulting e-book will be tested for validity by three expert validators.

4. Testing, Evaluation, and Revision

The data analysis test used was a practicality test. A Practicality Test for a Book is an evaluation method to assess how effective and suitable a textbook or teaching material is for use in the learning process. This test aims to ensure that the book can be easily understood, used, and provides benefits for students in achieving learning objectives. Students will evaluate the e-book (practical test) by being given an assessment questionnaire. This trial will involve randomly

selected 4th semester Entrepreneurship study program students, with 10 students involved in small groups.

5. Implementation

Implementation is the final stage where e-books are widely distributed and used in the classroom learning process.

Time and Place of Research

This research will be conducted in the Entrepreneurship Study Program, Faculty of Economics, UNIMED, for one year, starting from January to December 2024.

Research Population and Sample

The population of this research consists of students in 5th Semesters of the Entrepreneurship Study Program, with a total of 80 people. They are selected because they were registered in the Green Business course in the even semester of 2023/2024. The planned sample is 40 students. who

Data Collection Instrument

The questionnaire used in this study was a student response questionnaire. The student response questionnaire aims to determine students' responses after using the Green Business e-book that was developed. The following is a grid of student response questionnaires (Munandar, 2021) as follows:

Table 1. Practicality Instrument Grid

No	Aspect	Indicator	Item Number
1.	Content Quality	a. Presentation of E-Book display.	1
		b. Presentation of material in E-Book.	5,6
		c. Use of sentences and language.	7,8
2.	Quality of Use	a. Use of E-Book in learning	2,3,4,9,10

Data Analysis

The percentage of the practicality questionnaire is found using the following formula:

$$\text{Practicality} = (\text{Average Score}) / (\text{Maximum Score}) \times 100 \text{ (Azis, 2019)}$$

RESULTS

The entire research activity involved 5 stages, namely (1) Preliminary Investigation; (2) Design; (3) Realization/Construction; (4) Test, Evaluation, and Revision; and (5) Implementation. The results of this research can be described as follows:

1. Preliminary Investigation

- a. Needs Analysis

The purpose of needs analysis is to identify the steps that need to be taken to achieve the desired goals and improve existing deficiencies. Interviews with lecturers revealed that teaching would be more effective if supported by dare teaching materials that include videos that can be accessed offline, case study articles, and scientific journals. In addition, images in the book should be presented in 3D format so that students can see the images more realistically and interactively. The results of this needs analysis are used as a guide in compiling the Green Business book.

b. Learning obstacle Analysis

Based on the interview results, some of the problems faced by students include: difficulty in understanding the basic concepts of Green Business, such as the difference between greenwashing and actual drop-in practices; difficulty in analyzing case studies of companies implementing Green Business strategies due to a lack of understanding of desirability indicators and relevant data; lack of confidence in designing Green Business strategies that can be implemented in the real world, especially in the industries they are interested in; limited environmental knowledge, which hinders their understanding of the urgency of Green Business; and low interest in the topic of Green Business, because it is considered an abstract concept or not relevant to their future careers.

2. *Design*

At this stage, the contents of the book which consists of 10 chapters are prepared.

The selected content for this Green Business book is:

Chapter 1: Basic Concepts of Green Business

Chapter 2: Fossil Fuels

Chapter 3: Global Warming

Chapter 4: Renewable Energy

Chapter 5: Green Production

Chapter 6: Management of Production Waste

Chapter 7: Green Price

Chapter 8: Green Supply Chain Management

Chapter 9: Green Office

Chapter 10: Green Certification and Corporate Social Responsibility (CSR)

3. *Realization/Construction Phase*

a. Layout Process

The book layout process involves the steps to organize and arrange text, images, graphics, and other elements in a book so that it is ready to be printed or published digitally. The stages in this process include determining the theme, setting margins for e-books, layout, and merging all layout pages into a PDF format.

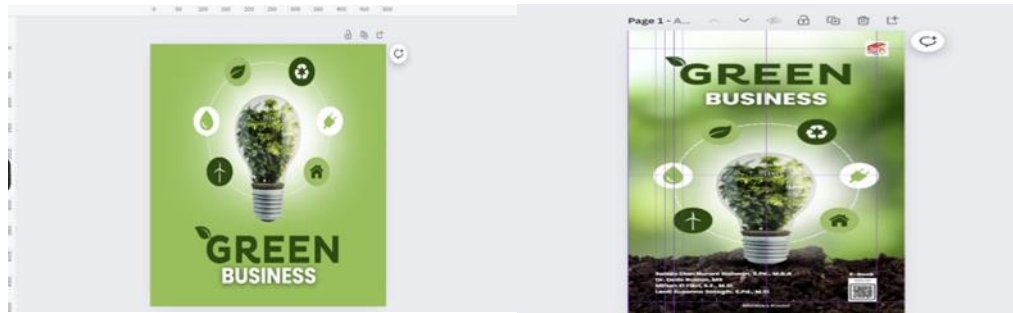


Fig. 1. Layout Process

b. Uploading the Book into the Flipbook Creator

After the layout process is complete, the next step is to convert the e-book into Flipbook format. The steps are as follows: open the FLIP PDF PROFESSIONAL application > select New Project, upload the e-book PDF file that has been laid out, adjust the UI/UX design for the device to be used, edit the page to add videos, access links, and other customizations, then export or publish the file in HTML (HyperText Markup Language) format. The appearance of the e-book after being exported in HTML format can be seen in the image below:

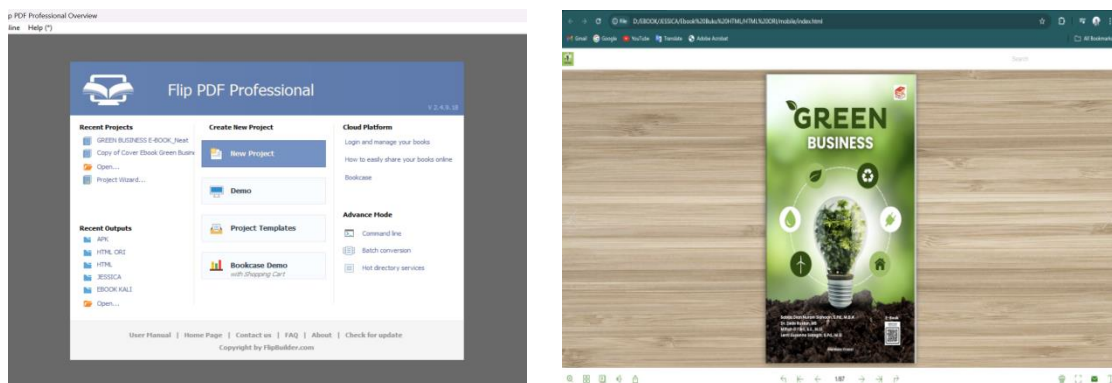


Fig. 2. Ebook Display in HTML

c. Insertion and Editing Process in Asembler App

The steps involved opening Assembler Studio, creating a new project, and adding the desired 3D objects. For instance, in this book, 3D images are used in chapters on fossil fuels, renewable energy, global warming, and so forth. The next step is to adjust the position and size of each object to create the desired atmosphere. Once the editing and adjustments are complete, the final step is to publish the image or project

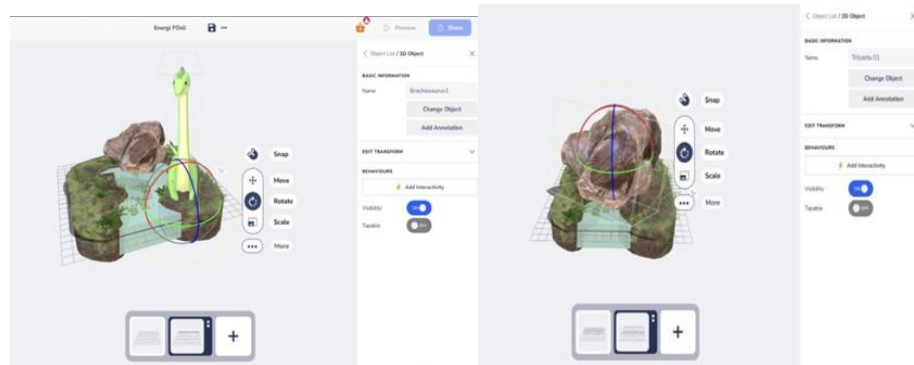


Fig 4. 3D Object Positioning

Once the E-Book is in HTML, it can be converted into an APK (Application) using Website 2 APK Builder. The stages carried out are: Fill in the APK requirements as needed, Build APK, Moving and Installing Apps to Android.

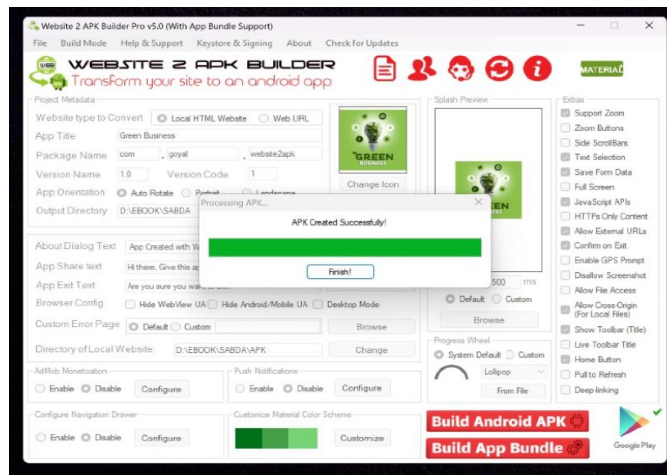


Fig 5. Moving and Installing Apps on Android

Once installed, the application interface on the Android device is shown in the image below. The clean and intuitive design makes it easy for users to navigate



Fig. 6. Augmented Reality Flipbook Application Display on Android

4. Test, Evaluation and Revision Phase

Practical testing is a stage in the evaluation and development of products, such as books, modules, or learning tools, which aims to assess the extent to which the product is easy to use and implement by target users. The Green Business book that has been developed will be assessed by target users, namely students of the Entrepreneurship study program. The practicality test was conducted on a research sample consisting of 48 fifth-semester students of the Entrepreneurship program. A questionnaire was distributed to students, and they gave an assessment of the book. The questionnaire included 12 question items, which were divided into aspects of content feasibility (5 items), presentation (4 items), and language (3 items).

➤ Practical Aspect of Material

The practical value of the material aspect of the book can be known through the following calculation:

$$\begin{aligned} \text{Practical Value} &= (\text{Average Score}) / (\text{Maximum Score}) \times 100\% \\ &= ((211+207+211+208+208)/5) / (48 \times 5) \times 100\% \\ &= 209/240 \times 100\% \\ &= 87.08\% \end{aligned}$$

➤ Practical Aspect of Language

The practical value of the language aspect of the book can be known through the following calculation:

$$\begin{aligned} \text{Practical Value} &= (\text{Average Score}) / (\text{Maximum Score}) \times 100\% \\ &= ((207+209+207)/3) / (48 \times 5) \times 100\% \\ &= 208.33/240 \times 100\% \\ &= 86.81\% \end{aligned}$$

➤ Practical Aspect of Presentation

The practical value of the presentation aspect of the book can be known through the following calculation:

$$\begin{aligned} \text{Practical Value} &= (\text{Average Score}) / (\text{Maximum Score}) \times 100\% \\ &= ((208+213+215+214)/4) / (48 \times 5) \times 100\% \\ &= 212.5/240 \times 100\% \\ &= 88.54\% \end{aligned}$$

A summary of the practical values obtained from students can be summarized in the following table:

Table 2. Practical Values

No	Aspect	Percentage	Description
1	Material	87,08%	Very Practical
2	Language	86,81%	Very Practical
3	Presentation	88,54%	Very Practical
	Total	87,47%	Very Practical

Based on the table, it can be concluded that the Android-based Green Business electronic flipbook with augmented reality technology has a practicality value of 87.47%, indicating that this book is very practical to use.

The practicality value in terms of material is 87.08%, in terms of language is 86.81%, and in terms of presentation is 88.54%, all of which are included in the very practical category. Several respondents also noted that there were several terms in the book that were difficult to understand, so a product revision was carried out to improve and perfect the book according to input from respondents.

DISCUSSION

The discussion in this study aims to answer the problems that have been formulated. The following is a discussion based on the research results obtained. This development research produces two main things: first, the creation of Green Business books and e-books; and second, an assessment of the level of feasibility, effectiveness, and practicality of the Green Business e-book that has been developed.

Android-Based Electronic Flipbook with Augmented Reality Technology

The result of the compilation of the Green Business book consists of two formats, namely print and e-book. The book has been registered with its ISBN. Most importantly, this book is presented in flipbook format with Augmented Reality (3D) technology and can be accessed via Android devices.

Level of Feasibility, Effectiveness, and Practicality of the Book

The practicality test was conducted through a questionnaire distributed to students as research objects, with an assessment of three aspects: material, presentation, and language. In terms of material, the book gets a percentage of 87.08%, categorized as very practical. The language aspect gets a percentage of 86.81%, also in the very practical category. The presentation aspect obtained a score of 88.54%, which is included in the very practical category. Overall, the total percentage of practicality is 87.47%, indicating that the Green Business e-book is very practical to use.

CONCLUSIONS AND RECOMMENDATIONS

The results of this study indicate that the Green Business book is able to significantly improve student learning achievement in the Entrepreneurship study program. With the presence of an Android-based electronic flipbook equipped with augmented reality technology, students can access Green Business materials in a faster, more practical, and interactive way. This innovation not only simplifies the learning process, but is also effective in improving student literacy and learning outcomes, thus encouraging them to be more active and involved in learning activities.

According to the validity assessment of the validators, the Green Business book was declared suitable for use with a validity level of 86%. In addition, the student's practicality assessment showed a figure of 87.47%, indicating that this book is very practical and easy to use in learning. With these satisfactory results, the Green Business book has proven to be not only academically relevant but also recognized for its practicality in supporting the improvement of the quality of student learning.

FURTHER STUDY

This study, like other studies, has limitations, so the following suggestions are formulated:

1. It is important to ensure effective communication between researchers and study programs, especially lecturers in charge of Green Business courses, in determining the material to be compiled.
2. The material in the book should be developed gradually from low to high levels of difficulty, taking into account the semester learning plan and available facilities, so that the compilation process can be carried out properly and the results are optimal.
3. Books that have been compiled should be well maintained to prevent damage, so that they can be reused in the following academic year, as long as they are still in accordance with the curriculum applied in the study program.

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