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Designing UI and UX Design in GenApp Application Using Design Thinking Method

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Abstract

This research aims to create an ARBook learning application design for high school students on genetic material. Today's growing technology has affected various fields, one of which is education. Generation Z is a generation that understands and is literate in technology. High school students born in Generation Z have characteristics that tend to like technology, are smart, open, and like to express themselves. To attract students' interest in learning, there needs to be media used by utilizing technology. It is necessary to understand the characteristics of students when making learning media design. The method used in this research is the design thinking method, which has five stages: emphasize, define, ideate, prototype, and test. This research produces an ARBook GenApp application design that suits the characteristics of Generation Z students. The test results from the student response trial obtained good results of 89.17%, which were included in the very feasible criteria.

A. Introduction

The development of technology in this era has grown rapidly. The era of automation technology and cyber technology marks the emergence of the industrial revolution 4.0 era (Effendi & Wahidy, 2019). Technological developments encourage changes in various fields, including education. The utilization of technology in education is not only as a medium of information but also in the form of learning media, for example, learning applications. Learning media that is made must be in accordance with the needs and characteristics of its users, because good and fun media can attract the interest of users or students who use it. Not only that, the display also needs to be considered, a good user interface design will make students or users interested in using the media.

High school students this year are people who were born in the 2004-2007 time span, where the generation between these years is included in generation Z, because generation Z is a person who is in the birth year 1998 to 2009 (Prismanata & Sari, 2022). Younger members of Generation Z ranged in age from 11 to 18 (Alsaadi et al., 2024). Generation Z is a generation that is close to technology. Generation Z, a generation called digital natives, is a generation that has known electronic media since birth and has also used the internet (Nurhayati et al., 2020). Generation Z has the characteristics of being fond of technology, flexible, smarter, open, likes visuals (photos, images, or videos), likes to express, pragmatic and analytical, difficult to focus, and multitasking (Prismanata & Sari, 2022). A significant number of members of Generation Z have formed an emotional bond with the internet (Babu et al., 2024). This affects the design characteristics possessed by Generation Z. Generation Z has visual preferences such as preferring minimalist designs, bold and bright colors, and animation. One of the popular designs today is the flat design. Flat design is very suitable with the characteristics of generation Z students. Flat design has a minimalist style principle, and is a simplified form of the original form. The principle of flat design itself is a simple form of the original form, focusing on solid colors, objects without texture, typography, and simple user interfaces (Yasa et al., 2022).

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In designing learning media that are interesting and not boring, a good interface design is needed. User needs and experience must be considered in designing an application design (Alam et al., 2023). User interface design for an application is a very important part (Assaufa & Arifin, 2023). User interface is the interface that is seen in a program. When users can run the application efficiently without obstacles, it indicates that the user interface is successful (Dopades et al., 2023).

Apart from the user interface, the user experience is one that should not be forgotten in the development of an application. User experience is the user experience when using media, which is related to the interface, functions, and features (Raschintasofi & Yani, 2023). Making an attractive application display can increase student interest in learning.

The use of learning applications can be used on material that is quite difficult to understand, namely genetics material in biology subjects. There are several studies that state that genetic material is quite difficult to learn. According to Chu, in his research, understanding genetic material is not just memorized but must use logic. In his research, as many as 86% of students felt that genetic material was classified as difficult (Chu, 2015). Hidayat & Kasmiruddin (2020) stated in their research that students find it difficult to understand the concept of genetics because it is abstract and not close to everyday life. Based on interviews with biology subject teachers at the SMA Laboratorium UPI Kampus Cibiru, information was obtained that in the biology subject, genetics material was still delivered through PowerPoint media and learning videos. In the delivery of this material, the teacher still has difficulty because the material cannot be understood directly by students, where there is material about DNA, RNA, and chromosomes whose form cannot be seen directly by the eye, so it tends to be difficult for students to understand. The use of mobile-based learning media can make it easier for students to learn, because it can be done anywhere and at any time, mobile learning is becoming more and more popular (Faudzi et al., 2024).

Therefore, as a solution to the problems that have been described, a learning media that combines books and applications with augmented reality technology will be designed and built. The use of AR for learning through gadgets allows AR learning experiences to be more accessible in various educational environments (Bermúdez & Caro, 2023). In addition, the use of AR allows information and images to be directly placed in the user's field of view (Golomingi et al., 2023). This interactive technology will assist students in learning actively rather than passively, as they would when reading a textbook (Latif et al., 2023). The use of this interesting media innovation is expected to make the material easier to understand. Based on research conducted by Prismanata & Sari (2022), it states that making learning media for generation Z needs to consider elements of multimedia design principles and visual principles with web, application, or audiovisual formats. Based on this, making learning media for generation Z will certainly be different by applying attractive visual principles in accordance with generation Z. Based on the explanation above, this research will design a learning application interface based on good and interesting genetic material for learning media based on the characteristics of high school students who belong to generation Z in order to get design results that are in accordance with student needs.

B. Research Methods

This research uses the Design Thinking method. Design thinking is a process of creating an innovation with thinking, thinking skills, innovation or new product development processes, problem solving tools, and guidelines (Kasri et al., 2021). This method focuses on solving user-focused problems (Y, 2020). This method has five stages, namely, empathize, define, ideate, prototype, and test (Y, 2020). The stages of the design thinking method flow can be seen in Figure1.

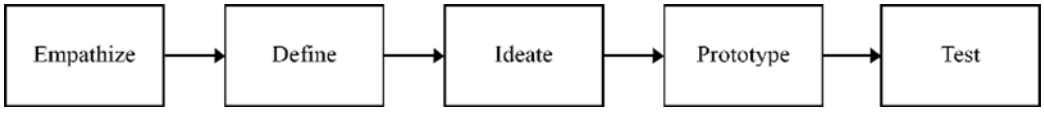

Figure 1. Stages of the Design Thinking Method

1. Emphatize
   Emphatize is the first stage of the design thinking method. This stage is an approach to understanding users and understanding user needs. This can be done by interviewing or observing users (Y, 2020).
2. Define
   This stage is a stage in listing the needs of users, or it can be called the data analysis stage from the data that has been obtained in the previous stage (Y, 2020). This stage describes the problems obtained

so that problem solving is obtained. This step generates problem formulations based on the data, and we then validate the outcomes to be accepted.

3. Ideate
   The idea stage is the stage of the solution creation process (Y, 2020). This process concentrates on generating ideas as a reference in creating prototypes (Ma'arief et al., 2021). At this stage, ideas begin to be developed that will become solutions to the problems obtained (Yudhanto et al., 2024).

4. Prototype
   At this stage, the ideas that have been obtained in the next stage are realized in the form of simple prototypes (Y, 2020). At this stage, the initial design that has been made is tested on users to get responses to improve the design (Ma'arief et al., 2021).

5. Test
   The last stage in the design thinking method is testing. Test is the testing stage of the product that has been made (Y, 2020). At this stage, the application or product is also tested on users.

The participants involved in this study were media experts, material experts and XII grade high school students majoring in MIPA. Media validation is carried out by lecturers who are in accordance with their fields. Material validation was carried out by biology teachers. In this study, the population and samples taken were class XII students with science specialization majors at the SMA Laboratorium UPI Kampus Cibiru, totaling 21 people. Testing uses Likert scale type measurements. Likert scale is a scale used to measure attitudes, opinions and perceptions of a person or group of people about a phenomenon (Sugiyono, 2018).

C. Results and Discussion

This research aims to produce a learning application design that combines augmented reality technology and books, or ARBook. The design of this learning application and ARBook is designed and adapted to biology subject matter in the genetics material section. The following are the results and discussion of the design of the GenApp learning application using the design thinking method.

1. Emphatize
   At this stage, it starts with conducting a literature review of the problems found and conducting interviews with biology teachers at SMA Laboratorium. Based on the results of interviews with biology subject teachers at SMA Laboratorium UPI Cibiru Campus, information was obtained that in the biology subject, genetics material was still delivered through PowerPoint media and learning videos. In the delivery of this material, the teacher still has difficulties because the material cannot be understood directly by students, where there is material about DNA, RNA, and chromosomes whose form cannot be seen directly by the eye, so it tends to be difficult for students to understand. After that, understand the characteristics of high school students in order to get design results that suit the needs of students.

2. Define
   After conducting interviews with sources, namely teachers, at this stage the data that has been collected is analyzed to get user needs and the purpose of the application to be made, such as collecting material, formulating features in the application. Based on the results of the interview, there are several problems, namely, learning media still use PowerPoint slides so that students still have difficulty understanding abstract material. From these problems, a solution is made, namely making interesting learning applications by utilizing technology.

3. Ideate
   At the ideation stage, all designs that have been made from the beginning are developed into an idea for making an application design. Based on the results of the empathy and define stages at this stage, ideas are obtained in making the GenApp application design. The following are the features that will be developed in the application.
   a. Material feature
      The application to be developed is a learning application; therefore, the material fitu should not be omitted because it will reduce the function of the learning application itself.
   b. AR and ARBook features

In the application, users can use augmented reality technology, where, this feature provides a new innovation that is a merger between the real world and the virtual world. This feature helps users in understanding the material studied, namely genetics.

c. Quiz feature

This feature can help users understand after learning using the application.

Furthermore, after developing the concept, the next step is making the application flowchart.

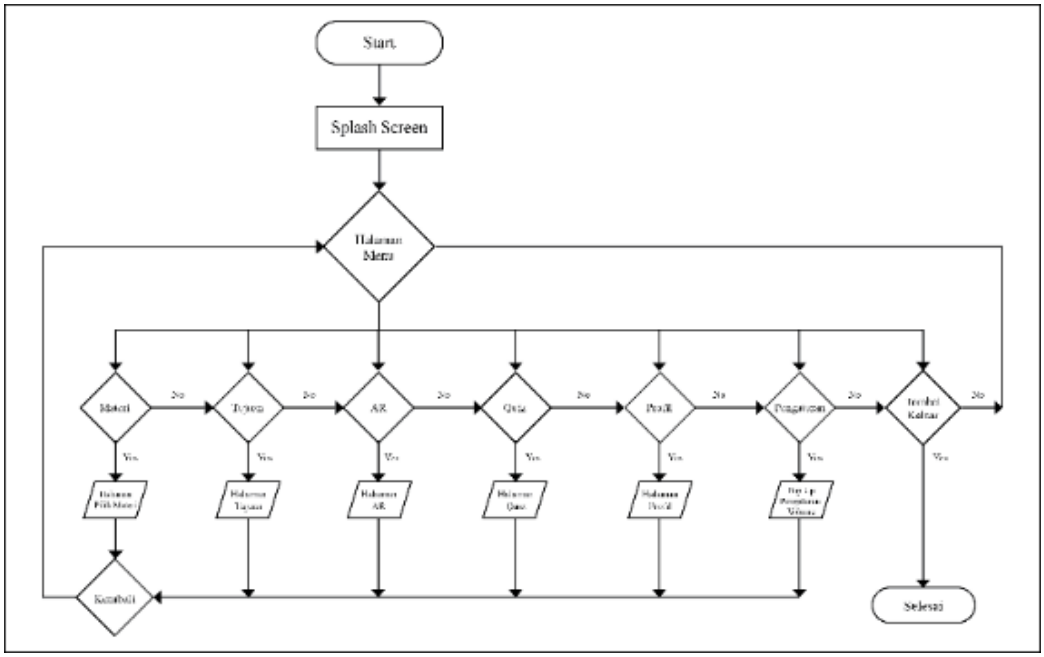

Figure 2. Application flowchart

After creating an overview of the application, the next step is to create application design requirements, starting with the selection of colors, typography, logos, and others.

4. Prototype

a. Low Fidelity

Low fidelity is an application display in skeletal form with no color, writing, or content yet (Dumalang et al., 2023). This form can also be called a wireframe.

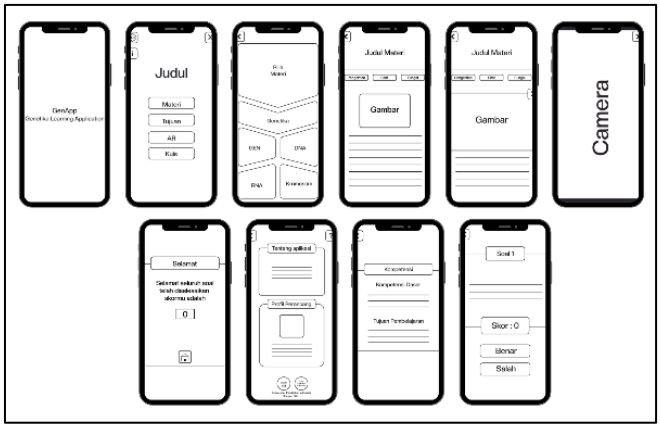

Figure 3. Wireframe view of the app

b. High fidelity

High fidelity is an application display that is already similar to the finished application (Dumalang et al., 2023). The application consists of several pages, namely the splash screen page; menu page; on the menu page there are options to go to the material, objective, AR, and quiz pages; select

material page; material page; material objective page; profile page; information page; quiz page; and AR page.

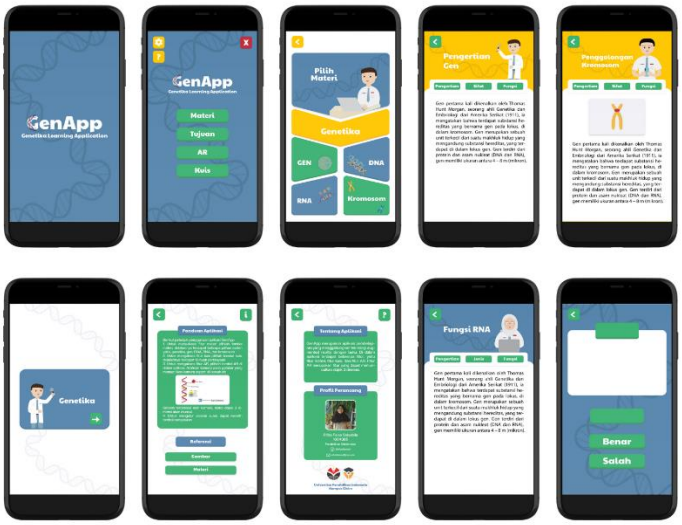

Figure 4. User interface application

c. ARBook Design View

This ARBook or interactive book has the same theme as the application, namely green and blue colors. In this book, there are materials and images that are used as markers for augmented reality detection.

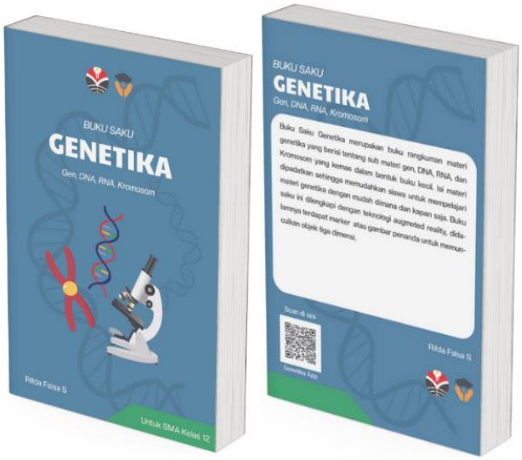

Figure 5. Mock up Book

Figure 6. Mock up Book

5. Testing
   At the test or testing stage, testing is carried out to users, namely students, regarding the appearance of the application design. The following is a list of testing criteria given to users, based on a questionnaire grid adapted from (Widodo & Utomo, 2021).

Table 1. Student Response Test Questionnaire Grid

Aspect	Criteria
User satisfaction	App display is easy to understand
	Easy to read fonts
	Good color composition
	Attractive objects
	Ease of navigation buttons
	Language is easy to understand
Usability of the application	Function as learning media
	Interesting display
	Helps students
	Increase understanding of genetics material
Ease of use of the application	Easy to use
	This application is interesting
	No error occurs
The attractiveness of the application	The material in the application is easy to understand
	The application design is in accordance with the material
	The application adds to the spirit of learning
Book assessment	Book design is in accordance with the application theme
	The color in the book is good

The results of the application trial assessment get the following.

Table 2. Student Response Trial Results

Aspects	Maximum score	Score obtained	%	Category
User satisfaction	630	555	88,10	very feasible
Usability of the application	420	380	90,48%	very feasible
Ease of use of the app	315	269	85,40%	very feasible
App appeal	315	270	85,71	very feasible
Book assessment	201	202	96,19	very feasible
Total			89,17%	very feasible

Source : Widodo & Utomo, 2021

Based on the results of the calculation of the student response trial of 21 students, the total result is 89.17%, in the aspect of user satisfaction getting a value of 88.10%, the usability aspect of the application is 90.48%, the aspect of ease of use of the application is 85.40%, the attractiveness of the application is 86%, and the book assessment is 96.19%. Referring to this assessment, the GenApp and ARBook applications received a good response and received the “very feasible” category.

Based on the test results, it is found that high school students who are part of generation Z who are still 17–18 years old like to use technology in learning. The incorporation of augmented reality technology in learning applications and books makes it easier for students to learn anywhere and anytime. Genetic material that is felt by students is quite difficult to understand, using technology-based learning media innovations can make it easier for students to understand the material. The augmented reality feature added in the learning application makes it easier for students to understand what DNA, RNA, and chromosomes look like. Not only that, the user interface used in making applications is adjusted to the style of generation Z, who likes minimalist and flat design, the colors in applications and books are designed according to the visual preferences of generation Z, who likes bright colors. So that according to the assessment of students, the appearance or user interface in the application is considered good or feasible.

D. Conclusion

The results of the study produced a prototype design of learning media applications with augmented reality technology GenApp and ARBook Genetics to help learning biology on genetics material developed using the design thinking method. In this research, the stages passed are empathize, define, ideate, prototype, and testing. The application design is adapted to the characteristics of high school students who belong to generation Z.

The results of testing applications and ARBook by media experts get very feasible results. Material testing by material experts, getting very feasible results. Based on the validation assessment of material and media experts, the application and ARBook are declared feasible and can be used as additional learning media on genetics material.

In the results of student response trial testing conducted by 21 students of class XII MIPA at SMA Laboratorium UPI Cibiru, the application design received a good response, which received a score in the very feasible category. The enthusiastic response of students when trying the application adds to the assessment of the application, and ARBook can be used as additional learning media.

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