Development of Android Game Learning Aerospace Insights

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Abstract. Aerospace insight is one of the parts of Archipelago insight and is important for every citizen to understand the urgency of civic education in the nation and State. The low interest in learning from archipelago insight students can be improved through learning media, such as experimental devices, simulations, and games. This research approach uses the Research and Development method, with the final product is a game application. This research is divided into two stages. The first stage is the game development and the second is testing. Game Ambassador Indonesia is designed and built in the form of software inserted questions about the concept of insight archipelago, especially aerospace insights. From the experiments conducted, 77% of students had no difficulty and were happy to use this game and add to their aerospace insights. So it can be concluded that research products are easy to apply. Increasing students' knowledge of archipelago insights (aerospace insights) can stimulate students to learn and be used as an alternative learning media. conducted 77% of students had no difficulty and were happy to use this game and add to their aerospace insights. So it can be concluded that research products are easy to apply, increase students' knowledge of archipelago insights (aerospace insights) can stimulate students to learn and can be used as an alternative learning media.

Keywords: Archipelago insight, Aerospace insights, Game Education.

1 Introduction

Archipelagic insight has become a vision for developing the nation and state that Indonesia's founders have long instilled. Archipelagic insight is an Indonesia's maritime development towards a world maritime axis which has been regulated in the Draft Law on Archipelagic Insights. Archipelagic Insights has been regulated in various laws and regulations in the maritime sector, the Law Number 17 of 1985 concerning about the ratification of UNCLOS 1982, Law Number 6 of 1996 concerning Indonesian Waters, the law Number 43 of 2008 concerning the territory of the country and Law Number 32 of 2014 concerning Maritime Affairs [1]. Understanding the insights of the archipelago can also be done through non-formal education, the community is also involved in fostering nationalism with the aim that all components of Indonesian citizens know the boundaries of Indonesia's sea or waters and land and air areas [2]. Based on the Convention on International Civil Aviation of 7 December 1944, hereinafter referred to as the first Convention, state parties recognize that each State has total and exclusive sovereignty over the air space in its territory. The convention also defines the definition of "territory", the term territory of each country's territory is its landmass and adjacent territorial waters, which includes the sovereignty, mandate or protection of that country to property or living things. The convention also defines nationality, country of registration as a nationality people or property. For example an aircraft can only be registered in one country, but its registration can be transferred to another country under certain conditions in accordance with international regulations. All aircraft to operate in international space must have the appropriate nationality and registration marks [3]. Therefore, from the nationality point of view, Aerospace insights is a part of archipelago insights [4].

The Archipelagic Outlook is defined as the perspective of the Indonesian nation about itself and its environment with its national ideas based on Pancasila and the 1945 Constitution. This is the aspiration of an independent, sovereign, dignified nation, and it animates the way of life and acts of wisdom for national goals. The Archipelagic Insight is a way of experiencing, a perspective, a way of thinking, a way of understanding, a way of behaving, a way of acting, a way of behaving as the Indonesian Nation

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as part of the interaction of psychological, sociocultural, and ASTAGATRA aspects, namely geographical conditions, natural wealth, and population capabilities as well as ideology, politics, economy, social, culture, defense and security [5]. The Archipelagic Insight not only strengthens the national character but also positions various problems in the eyes of nationalism [2].

Indonesia is one of the most multicultural countries in the world. Indonesia's diversity is reflected in differences in ethnicity, race, culture, and religion. Unsurprisingly, Indonesia will face the threat of national disintegration due to differences in ethnicity, race, culture, and religion. Therefore, the perspective of archipelago insight by fostering diversity in Indonesia can create unity and integrity to form national geostrategic resilience. That concept exists in Indonesia. The creation of existing unity and integrity and understanding the perception of seeing differences is not a threat to realizing national resilience in the Indonesian nation [6].

For this reason, learning media is needed that can be used as a tool foster enthusiasm for learning and increase knowledge about aerospace insights. One of the learning media is educational games. Educational games as learning media are commonly referred to as educational games. At present, many educational games have been developed to support various subjects, to support curriculum development, especially understanding nationality as well To develop character education, an educational media design is needed that can answer these needs.

There is research on making games with insight into the archipelago by Minto Santoso, M.Pd. The difference with this game lies in the game development by Minto Santoso, M.Pd. (2018) put more emphasis on the map of Indonesia in accordance with the provisions of the Archipelagic Outlook [7], while the development of this game emphasizes the archipelago insight related to aerospace insight. The Indonesian Archipelagic Insight game application (aerospace insight) is also different from the gameplay application "Merah Putih" which corresponds to N. Kidi (2017), a creation in the form of a variation of a puzzle game on the Android platform with the theme of Indonesian culture [8].

Educational games are a type of game that is used to deliver learning materials or types of games with educational content [9]. The application of the game is quite effective for students to motivate the desire to learn [10], [11], [12].

In addition to the trend of using information technology, the idea of using aerospace insight learning games is also intended as an alternative learning in the Covid-19 pandemic situation, in the Covid-19 situation face-to-face learning is limited, so that students can still learn it is necessary to develop learning media as an alternative.

The trend in the modern era in the field of education shows that the form of game education combined with a scientific component is more interesting [13]. To design effective educational games, especially in educational simulations, requires collaboration between content experts, educators, and software designers. This aims to ensure the achievement of learning objectives, learning methods, and the appearance of the software for students and can improve the quality of the educational process [14]. Games are one of the online learning media, and learning using computer applications is an alternative for the world of education, especially in dealing with the Covid-19 pandemic [15], [16], [17].

But in playing games, students who often play will get high scores [18]. The more often we play educational games, the faster we will understand the game instructions.[19].

Games can be used in education by lecturers and students for learning activities and increasing knowledge [20]. The advantage of learning applications in the form of games allow students to learn and repeat lessons anytime and anywhere [21]. Learning media is a tool for teaching and learning processes that can be used to stimulate thoughts, feelings, attention and abilities or learning skills to encourage the learning process [7].

2 Research Methods

This research was conducted in the period March-April 2023 conducted at Adisutjipto Institute Of Aerospace Technology Campus. In this study, stages consist of; analysis of the needs of learning media about active management of the third stage, planning of instructional media development design, development of instructional media, expert validation, one-on-one trials, small group trials, large group trials, and the final product of learning media [22].

The Game Development Life Cycle (GDLC) is a framework that is used as a guide in developing a game. There are 6 stages in GDLC which consist of: (1) Initiation: creating a game design for the game to be made. (2) Pre-Production: creating assets, mockups, and the navigation structure of the game design. (3) NProduction: making games from game designs that have previously been designed in pre-production. (4) Testing: carrying out internal tests to check game functionality so that they can be played. (5) Beta: carrying out external tests to get feedback from external parties (players). (6) Release: the game can be played by the general public. But the development of this aerospace insight game only reached the fifth stage.he research methods section presents the experimental methods clearly and completely in every detail facilitating reproducibility by other scientists.

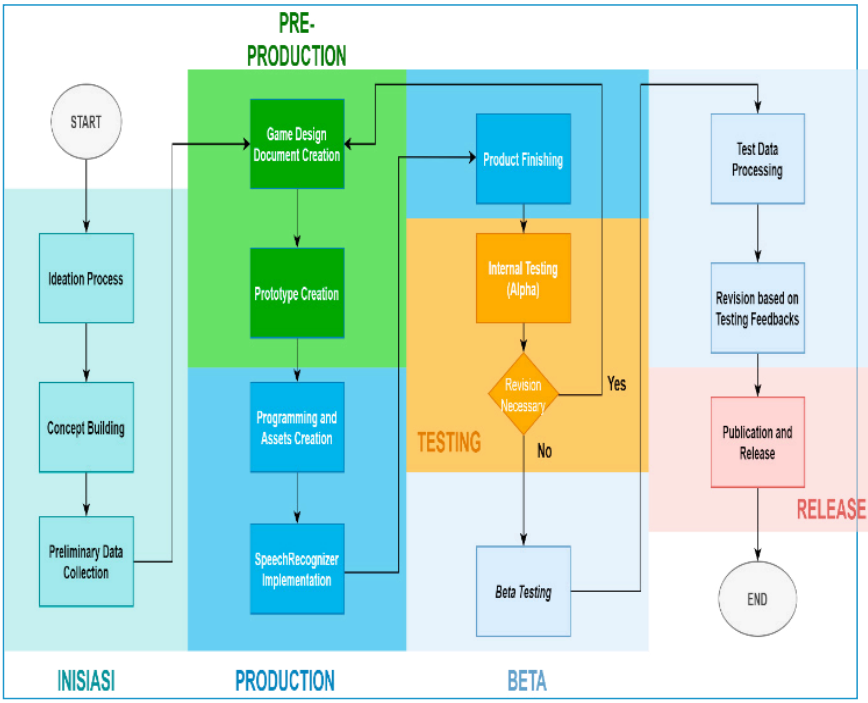

Fig. 1. Research Method of Game Development

The fig. 1. above is an image of a research design for making learning games. The learning design starts from designing, making game products, testing games to launching games.

The method used to perform user tests in the development process of the game is the Black Box Testing method, also known as Behavioral Testing, this method is a method of testing in which a tester tests a software or application without knowing the application in terms of structure, design, or computer implementation. This method is a testing method in which the tester sees the software to be tested as a black box, where when information is entered into the box, the box provides feedback [24].

Analysis and Design:

The initial stage of making a game is the appearance design stage of the game. After that, the game design was carried out sing prepared hardware and software. Based on the results of the analysis, then the design stage is carried out product design which includes three following stages:

1) Flowchart design Represents a composed chart of certain symbols show steps a procedure or program.
2) Design storyboardsMaking an internal media it is an educative game begins by making storyboardsso it can be seen the plan.

3) Preparation of material text, questions, and answerAll material to be loaded in media created in .html format (hypertext markup language) using the program Notepad++. Discussion of answers to be loaded is created in image format in .png format by using programs corelDRAW Graphics Suite X7. As for the direct matter put in java.
4) Manufacturing and collection background, images, and buttons Backgrounds, pictures and the buttons are made in format image.png usingcorelDRAW Graphics suite X7.Development Stage (Development)
5) At this stage of development, activities what to do is:
    a) Media Creation Media creation using Android Studio. All components that have prepared at the design stage assembled into a single unit intact media according to designed design. There are 4 activities in media production i.e. interface creation, coding, testing, and deploying.
    b) Validation at this stage early media validated by one media expert (lecturer) and one material expert (lecturer).The result is in the form of suggestions, comments, and usable input as a basis for doing revision I of the media developed.

Test the system with several trials and analyze system performance in each section Educational Game system and record the test results to conclude that the goal of making the game has been achieved. Goals have been achieved.

Data, Instruments, and Techniques Collection

a. Data

Data collected in this study includes qualitative data and quantitative, namely:

1) Qualitative data is data about the development process learning media in the form of criticism and suggestions from material experts and media expert.
2) Quantitative data is data principal in research in the form of assessment data about the media student learning, in the form of the percentage of answers.

Data collection instrument that used in this research is questionnaire (questionnaire).

Based on the description above, it is necessary to have an aerospace insight game application as an alternative learning media.

3 Results and Discussion

Results of educational games can be seen in Fig. 2 to Fig. 6. The main game design can be seen in Fig. 2.

Fig. 2. The main game design

In Fig. 2. we can see the initial appearance of the game along with the selection buttons on the monitor display

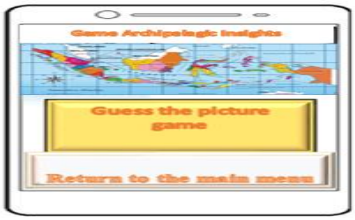

Fig. 3. The design of the material

The design of the material form can be seen in Fig. 3., and game type design can be seen in Fig. 3. On Fig. 2. is the game display when the player has selected and pressing the start button ie arrow button on the initial appearance of the game, players will a view like the one on the side. view this is a display of learning material that will be given to player, in this view there is a symbol Please select, sample application with image display it is hoped that players will be more interested in playing it and it will be easy easy for players to remember and understand. in the corner of the upper right corner there is also a display of an "x". its use is for closes the display and returns to the previous menu. Display In Figure 3, is a display when the player presses the play button on the main menu. In this view the player will choose the type of game to be played, there is two types of games, namely guess the picture or Adventure. In the display menu there is the icon on the top left and the "pause" and back buttons are active.

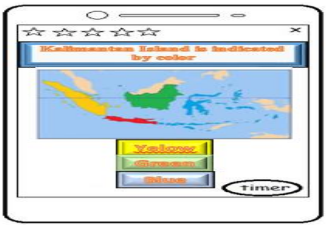

Fig. 4. Game Type Form Design been refined.

In Fig. 4. above we can see the appearance of the question about the location of the puffs in Indonesia. Fig. 4. Game Type Form Design been refined, the appearance of the game, in this image you can choose the available answers by clicking the button according to the color listed

Fig. 5. Questions about the Indonesian Flight Information Region (FIR).

Fig. 5. Questions about the Indonesian Flight Information Region (FIR). In the display of Fig. 5, we are asked to choose the right answer, this is an example of a question on the rules and means of flight navigation. In the display of Fig. 5, we are asked to choose the right answer, this is at the end of the game session there are correct answers, so that it is in accordance with the function of the game to increase student knowledge and as a learning mediuman example of a question on the rules and means of flight navigation. In the display of Fig. 5, we are asked to choose the right answer, this is at the end of the game session there are correct answers, so that it is in accordance with the function of the game to increase student knowledgthis is as shown in fig. 5.

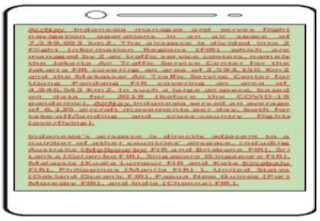

Fig. 6. Explanation regarding the Indonesian Flight Information Region (FIR).

In **fig. 6.** is an explanation of the question in **fig. 5.** In this game, besides containing questions it also contains the correct answers to questions, so that students can also learn and know the correct answers.

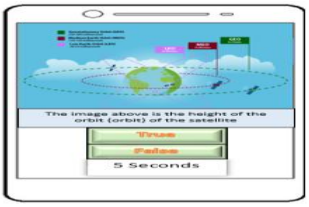

Fig. 7. Question about satellite orbite

In fig. 7. is a question regarding satellite orbits, this is a question regarding aerospace insights related to outer spacee and as a learning mediuman example of a question on the rules and means of flight navigation.

At the implementation stage is a description of the application system to the goal ready to use application. this stage carried out after the analysis and design phase, on implementation phase will explain about applications that have been made and views from game applications as well as game tests whether it is in accordance with the purpose of making games and game eligibility. From the test results that been done, it can be concluded

Does it match the expected results?

with the purpose of making a game or not appropriate.

The result of the game design is the final form of the game application and has complied with initial design. In the previous design, only the display design was created as a reference for implementation at a later stage. In this section, every view that has been created to be complete system and accompanied by an explanation by adding and enhance every part of the existing game display considered less, the following is an explanation of each view that has.

In addition to being a question with answer choices that must be selected using the option button which can be done by respondents or users of Archipelagic Insights (aerospace insights), respondents or game users can also increase knowledge through information at the end of the question session, so that respondents can find out the right answers to questions. , so that it is in accordance with the purpose of using the game, namely to increase user knowledge.

At the implementation stage is an overview of the application system so that it is ready to use. At this implementation stage it is carried out after the analysis and design phase, at the implementation stage it can show that the application that has been made can be used as well as the results of the testing that has been carried out, it will be concluded whether in accordance with the expected results in accordance with the objectives described in the previous chapter.

The design results are the final form that has been implemented in accordance with the initial design. In the previous design, only the appearance design was made which became a reference in implementing it into an application system. In this section, each interface that has been made into a complete system will be explained by adding and enhancing each part of the interface that is deemed lacking. The following is an explanation of each interface that has been converted into a system.

Educational game testing is intended to determine the extent to which the success of the system contained in educational games. As it is known that the educational game introduces insight into the archipelago, insight into aerospace. We can see the educational game narrative in Table 1.

Table 1. Educational Narrative Game

	Narrative	Information
1	Knowing and understanding the Archipelagic Insights	History of Archipelagic Insights
2	Knowing and understanding the Djuanda's declaration .	History of the Djuanda's declaration .
3	Knowing and understanding the provisions on state boundaries before the Djuanda declaration	History of international borders
4	Knowing and understanding the provisions on state boundaries in accordance the Djuanda declaration	Terms of the Djuanda declaration
5	Know about the boundaries of countries according to International law after the convention of the United Nations	International Provisions Border Lines
6	Knowledge of Indonesian Archipelagic Sea Lanes .	Rules concerning Indonesian Archipelagic Sea Lanes
7	Knowledge of aerospace insights	Understanding of aerospace insight
8	Which is the Kalimantan Island?	Guess the first please picture

9	Which is the Java Island?	Guess the second please picture
10	Which is the South China Sea ?	Guess the third please picture
11	Which is the Ambalat area ?	Guess the fourth precept
12	Which is the Natuna?	Guess the fifth precept image
13	Collect all the image pieces	Adventure games
14	Right	Correct answer
15	O'o	Wrong answer
16	You are great	Output score guess the picture
17	Questions about the Indonesian Flight Information Region (FIR).	Guess the six precept image
18	Explanation regarding the Indonesian Flight Information Region (FIR).	Material explanation
19	Question about satellite orbite .	Guess the seven precept image

In Table 1, there are 30 question items asked in the game with an outline of 19 questions with a total time duration of 1 minute maximum for each question.

The testing method used is to try to install the game application on several Android platforms with different versions. The following data is the result of installing educational games on several smartphones.

The data collection method in this study was a questionnaire or questionnaire that aims to determine the feasibility of educational games. The following is a list of questions given to users who have tried educational games (can be seen in Table 2). The questionnaire consists of seven questions that will be given to 30 respondents who are the Adisutjipto Institute Of Aerospace Technology who is taking the civics course majoring in aerospace engineering class B even semester 2022/2023.. Respondents were asked to check each answer “Yes” or “No”.

Table 2. Media Feasibility At Validation Stage

Criteria	Evaluation	
	Expert 1	Expert 2
1. Interesting color combinations	Worthy	Worthy
2. Colors do not interfere with game content	Worthy	Worthy
3. Using Indonesian with enhanced spelling	Worthy	Worthy
4. The language used is easy to understand	Worthy	Worthy
5. The words used are easy to understand	Worthy	Worthy

If we look at the table data above, this aerospace insight game is quite feasible to use as a learning medium for students.

Table 3. Analysis Of Expert Perceptions Of Educational Games

No	Aspect	Conclusion
1	Education technology factors	The rapid advancement of technology is very useful in the world of education as a medium of learning. With the existence of technology, the learning media produced are more innovative and varied, this is an attraction for students.
2	Utilization of technology in socialstudies learning	Various uses of technology as learning media, make the process more fun as well make it easier for students to understand the learning material.
3	Benefits of educational games	Educational games are very useful for facilitating student understanding and the learning process becomes interesting

Based on the table above, learning using game media can support the learning process for students.
Increasing Student Learning Interest

In the following, data on student learning interest is presented before and after being given treatment using games, which can be seen in the table below.

Table 4. Data On Student Learning Pretest-Postest

Value	Score before play game	Score after play game	Increase score (point)
Average score	60	90	30

To see how effective the game is, several stages of testing are carried out, including Pre-Test, Post-Test, and also User-Test for three days. The pre-test and post-test are given in the form of 19 questions about randomly displayed in-game material and order of answers. After Pre-Test, players will play this aerospace insight game for three days before the Post-Test. In the the Post-Test stage, players will answer the questions in the Post-Test, the questions given are the same as questions on the Pre-Test, but with a random order of questions. The following is the result evaluation of the game conducted by 30

respondents who took the user test.If we look at the table data above, there is an increase in understanding after playing this aerospace insight game. In Table 4 it can be seen that there was an increase of 30 points in the posttest results when compared to the pretest results.

Black Box Trial Results

At the black box testing stage, the components to be tested and indicators of success have been determined. The results of the black box trial are shown in Table 5.

Table 5. The Results Of The Black Box Trial

Function	Success Indicator	Actual Results
Splash screen starting the game	Enter the scene	Succeed
Button tap Enter the scene play menu	Will bring up contains information	Succeed
Pins button	contains information about the answer that has been chosen by the player	Succeed
Exit button	Closes the game	Succeed
Quiz button	Enter the scene	Succeed
Quiz answer button	Add points if the answer is correct	Succeed
Exploration back button	Return to the main menu scene	Succeed
Playback button	Repeat quizzes that have been passed	Succeed

If we look at the results of the black box test above, it can be seen that the game can operate properly and is suitable for use as a learning medium.

From questionnaires containing 19 questions, male respondents were more than female respondents, with a large percentage of male respondents was 63% and a significant proportion of women respondents was 37%. Based on the percentage of answers obtained from each choice of solutions can be concluded that more respondents aged 17 to 22 years, with a rate of 56%.

Respondents as students. Respondents use Android smartphone with a rate of 96% followed by smartphone operating system and iPhone of 4%. Based on the percentage of answers obtained from each of the answer options, it can be concluded that respondents are interested in using Android-based smartphone operating system, with a percentage of 98%. Respondents are sometimes using a smartphone as an entertainment to play games, with a percentage of 89%. Respondents who play games using a smartphone in one day for 1 to 3 hours, with a rate of 77% and respondents who like this game type.

Table 6. List Of Questionnaires

No	**Question**	**Response**	
		Yes	***No***
Display Quality			
1	Text and image layout is very good	23	7
2	Suitability of background selection is very good	24	6
3	Appropriateness of font size and font selection is Good enough	**24**	**6**
4	Color match is very good	25	5
5	The attractiveness of serving animated images is good enough	24	6
Program Quality			
6	Can playing games make it easier to the game?	21	9
7	Is the application example described easy to understand	21	9
8	Is the game easy to play	23	7
9	Is this educational game interesting	24	6
10	Can finish the Adventure game	26	4
11	Can answer the question guess the picture game	25	5
12	Is this educational game useful as a medium for learning Archipilegic Insights?	22	8
13	Ease of understanding button structure	23	7
14	Ease of entry and exit from the program	22	8
15	Ease of selecting program menus	23	7
Total		350	100
Average (%)		77.78%	22.22%

In Table 6, the results of the questionnaire from students, we can see that the game is feasible to use. System requirement is fulfilled by using questionnaires distributed to 30 respondents.

This Educational Game for Introduction and Understanding of Archipelagic Insight and Aerospace Insight for Android-Based Elementary School students can be an alternative learning media and used

for playing. The feasibility level of this educational game shows a percentage of 77.78% from the results of a questionnaire of 30 respondents, meaning that most of the respondents can play and understand this educational game.

Feasibility of Game Learning Media Android-based educational Aerospace Insights from materials, media experts, and practitioners accounting learning.

Things to note when developing a medium is the feasibility aspect of the media Alone.

1. Feasibility of learning media obtained based on expert judgment material (civic lecturer), expert media (Information Technology lecturer), here is the result of validation by the two experts.

learning mediuman example of a question on the rules and means of flight navigation

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CONCLUSION

This Educational Game for Introduction and Understanding of Archipelagic Insight and Aerospace Insight for Android-Based Elementary School students can be an alternative learning media as well as being used for playing. The feasibility level of this educational game shows a percentage of 77.78% from the results of a questionnaire of 30 respondents, meaning that most of the respondents can play and understand this educational game. If you look at this data, it can be concluded that this learning game can be an alternative for learning at school to support diktat books and explanations from teachers. To be more convincing, it is necessary to test more school students.

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