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DESIGN OF INTERACTIVE MULTIMEDIA AS LEARNING MEDIA ABOUT POLLUTION FOR ELEMENTARY SCHOOL STUDENTS

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Abstract

Pollution is a serious problem faced by humans because it can harm ecosystems and human health. Pollution generally occurs due to human activities that can damage ecosystems, such as industry, transportation, and waste. Understanding about pollution needs to be introduced early, especially to elementary school students, so that they have environmental awareness from an early age. Learning about pollution requires media that is interesting and easily understood by children. One effective solution is the use of interactive multimedia in the learning process. Interactive multimedia combines elements of text, images, audio, video and animation packaged in one interesting media. This media not only conveys information, but also allows students to interact directly with learning materials. Through the design of interactive multimedia about pollution, the learning process becomes more fun, communicative, and educational. With the existence of interactive multimedia as a learning media about pollution, it is hoped that students can understand and implement material about pollution into their daily lives and participate in preventing pollution.

Keywords: Interactive Multimedia, Pollution, Learning Media

INTRODUCTION

Pollution is an undesirable change in the physical, chemical and biological properties of air, soil and water. These changes can cause harm to human life or other organisms, industrial processes, dwellings and relics, or can damage the source of raw materials. Pollution occurs when there is a disturbance in the material cycle, namely when the rate of production of a substance exceeds the rate of disposal or use of the substance (Soemarwoto, 1990). Champ in his article quoted Warren (1971) about the term pollution adapted from the Greek "Pollutionem" which means to pollute. According to the Oxford English Dictionary documentation, the use of the term pollution can be traced back to the 14th century.

Learning media consists of two words, which are media and learning. The word media literally means intermediary or introducer while the word learning is defined as a condition to help someone carry out the status of learning activities. Learning media used in learning activities can be influenced by the effectiveness of learning (Sastafiana et al., 2024). Learning media is anything that is able to convey or distribute information effectively and efficiently in learning activities. In addition, learning media has the ability to provide the same stimulation,

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equalize experiences, and create the same perceptions (Munadi, 2008). Learning media is a messenger technology that can be used for learning purposes, and is also a physical and communication means to convey subject matter. Learning media is used with the aim of improving the quality of education. Learning media is the media used in the learning process and objectives. Learning media has an important role as a means of channeling learning messages. Therefore, the use of media as a link between educators and students is called learning. In other words, active learning activities require media support to deliver the material to be learned (Premana et al., 2022).

Multimedia is the use of computers to create and combine text, graphics, audio, moving images (video and animation) by combining links and tools that allow users to navigate, interact, create, and communicate (Suyanto, 2003).

According to Hofstetter in Munir (2015) interactive multimedia is the use of computers to combine text, graphics, audio, video moving images and animation into one unit with the right links and tools that allow multimedia users to navigate, interact, create, and communicate. With interactive multimedia, users can more actively interact with the media, not just as spectators. Interactive multimedia is the packaging of various types of media such as images, audio, text, and animation stored into digital files that are useful for channeling information and messages to the audience so that they can participate in teaching and learning activities effectively. Interactive multimedia programs have several advantages, including being interactive, providing an individual climate of affection, increasing learning motivation, providing feedback, and the control of its utilization is entirely in the user (Munadi, 2008). The interactive multimedia developed has interactive characteristics and is easy to operate, making students interact directly with the material in the media. Interactive multimedia can be a solution in learning, because it makes it easier for students to learn the material. Interactive multimedia has a dynamic display so that it can be a special attraction for students when compared to reading texts presented in pdf format. This interactive multimedia can also increase students' imagination and motivation with the visualization of the animation presented (Babiker, 2015).

IMPLEMENTATION METHOD

The design of interactive multimedia as a learning media about pollution for elementary school students includes several steps, namely: design treatment, visual development phase, programming phase, and testing phase. (Wibawanto, 2017). By using the five stages of the process, it is expected that this interactive multimedia work can be a good and useful work.

1. Design Treatment

   Design treatment is a stage in design that describes a detailed analysis of the work being done and what is needed in making it. Design treatment includes elements such as color, typography, illustration, layout, and overall visual style that are selected based on the design concept and objectives. The goal is to create a consistent, attractive, and easily recognizable appearance for the audience, so as to strengthen the message to be conveyed. In the process of designing interactive multimedia as a learning media for elementary school students, design treatment plays a role in determining several things, such as the

concept of interactive multimedia, visual style, color, and typography of the interactive multimedia.

2. Visual Development Phase
   Visual development phase is a stage in design that focuses on exploring, developing, and refining the visual elements of a work. At this phase, visual assets are created. The purpose of the visual development phase is to test possibilities of visual styles and to make sure that the final look is aligned with the message, audience, and project goals. In designing interactive multimedia as a learning media about pollution for elementary school students, this phase is used to create and organize visual assets, such as illustrations, buttons, and others.
3. Programming Phase
   Programming phase is the phase in the process of developing visual and functional designs translated into code or programming. This stage is used to run the various features that exist in interactive multimedia design so that it can be used properly and is useful as a learning media.
4. Testing Phase
   According to Wibawanto (2017), the testing phase is a process of collecting information to fix all design errors and programming errors. This stage is needed as a form of quality control of the learning media created. The purpose of this phase is to test and find out the shortcomings of the interactive multimedia design so that it can be improved and become more optimal.

RESULTS AND DISCUSSION

1. Project Specification
   Application name: Pollution Game
   Dimensions: 1280 x 720 pixels
   Operating system: Windows
2. Project Description
   "Pollution Game" is an interactive multimedia project that is used as a learning media about pollution. This interactive multimedia is designed as a learning media for elementary school students. This interactive multimedia can be accessed through Windows Operation System. "Pollution Game" involves the interaction of elementary school students as users.

   The interactive multimedia "Pollution Game" focuses on learning materials about pollution. The interactive multimedia "Pollution Game" has a function as a visualization and understanding of pollution with the aim that students can understand the lessons about pollution and can implement these lessons in everyday life as pollution prevention. "Pollution Game" has several games as features in it, such as puzzles and quizzes. In the interactive multimedia "Pollution Game" there is also a video containing learning lessons about pollution.

3. Project Analysis
   a. Application Icon

      The application icon is used as an interactive multimedia identity. Interactive multimedia application icons as learning media about pollution are made using Adobe Illustrator with sizes of 36 x 36 pixels, 72x72 pixels, 96x96 pixels, and 144x144 pixels.

      The "Pollution Game" application icon displays a chimney as a representation of pollution. The background, featuring shades of gray and beige, illustrates the dirty sky caused by pollution, following the theme of this interactive multimedia.

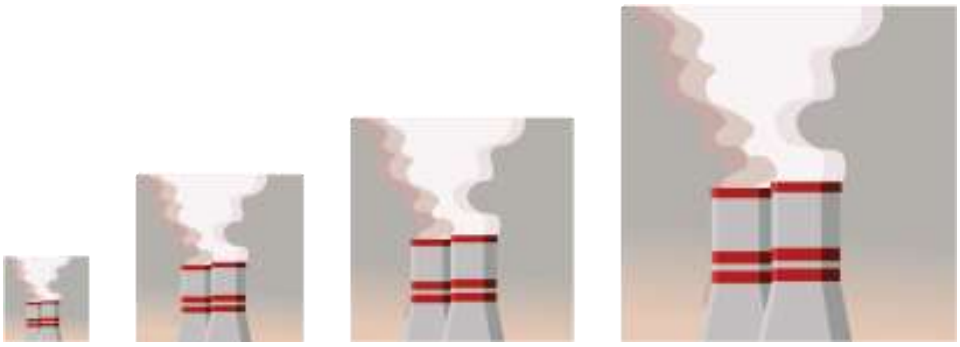

Figure 1. Application Icon

Source: Author's Documentation

   b. Main Menu Page

      The main menu page uses frames with a size of 1280x720 pixels in Adobe Animate. The main menu page contains content in the interactive multimedia as a learning media about pollution, such as games, trivia, videos, options, and quit. On the main menu page, there are several buttons that will redirect to interactive multimedia content about pollution.

Figure 2. Main Menu Page

Source: Author's Documentation

c. Game Selection Page

The game selection page uses frames with a size of 1280x720 pixels in Adobe Animate. On this page, there is a display about the choice of games that can be played by users. This game can be a means of entertainment after learning material about pollution. Game options that can be played on this interactive multimedia include puzzles and quizzes. In this page, there is also a back button and a home button to go to the main menu.

Figure 3. Game Selection Page
Source: Author's Documentation

d. Puzzle Game Page

On the puzzle game page, a frame of 1280x720 pixels in Adobe Animate is used. On this page, there is a puzzle display. This puzzle game can be played by the user. Users can arrange the available puzzles and solve them. On this page there is also a back button and a home button to go to the main menu.

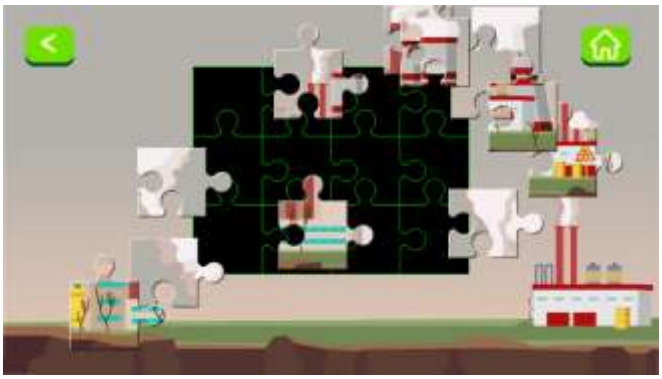

Figure 4. Puzzle Game Page
Source: Author's Documentation

e. Quiz Game Page

On the quiz game page, a frame of 1280x720 pixels in Adobe Animate is used. On this page, there is a quiz display about pollution. This quiz game can be played by the user. Users can complete the quiz as an evaluation after learning the material about pollution. There are several quizzes that can be completed and there will be a score at the end of the game. On this page, there is also a back button and a home button to go to the main menu.

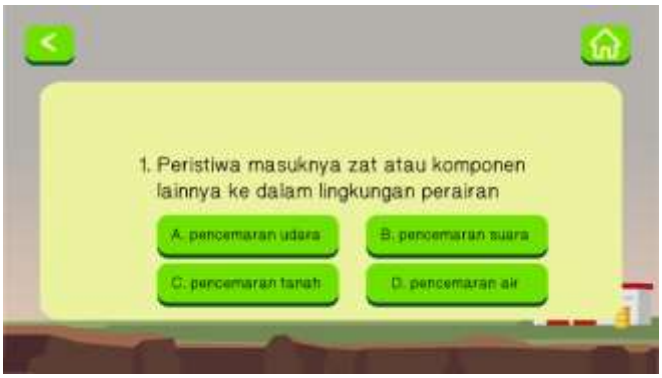

Figure 5. Quiz Game Page
Source: Author's Documentation

f. Trivia Selection Page

After clicking the trivia button, the user is directed to the pollution lesson selection page. On the pollution material selection page, a 1280x720 pixels frame in Adobe Animate is used. On this page, there are four illustrations depicting various types of pollution, such as air pollution, water pollution, soil pollution, and pollution. If this illustration is clicked, the user will be directed to the material page of each pollution. On this page there is also a back button and a home button to go to the main menu.

Figure 6 Trivia Selection Page
Source: Author's Documentation

g. Pollution Topic Selection Page

After clicking on the pollution illustration on the pollution type selection page, the user is directed to the material selection page of each pollution. On the pollution topic selection page, a 1280x720 pixels frame in Adobe Animate is used. On this page, there is a display containing illustrations of the pollution selected by the user and various explanatory options for each pollution, including understanding, causes, impacts and consequences, and how to deal with pollution. On this page, there is also a back button and a home button to go to the main menu.

Figure 7 Pollution Topic Selection Page
Source: Author's Documentation

h. Pollution Lesson Page
After clicking the option on the pollution topic selection page, the user is directed to the material page of each pollution. On the pollution lesson selection page, a 1280x720 pixels frame in Adobe Animate is used. On this page, there is a display containing illustrations of the pollution selected by the user and the topic of the selected pollution. On this page, there is also a back button, a home button to go to the main menu, and a button to go to the next lesson.

Figure 8 Pollution Lesson Page
Source: Author's Documentation

i. Pollution Learning Video Page
On the pollution learning video page, a 1280x720 pixels frame in Adobe Animate is used. On this page, there is a display containing a video explanation of the pollution selected by the user. On this page, there is also a back button and a home button to go to the main menu.

Figure 9 Pollution Learning Video Page
Source: Author's Documentation

j. Options Page

After clicking the options button, the user is directed to the options page. On the options page, a 1280x720 pixels frame in Adobe Animate is used. On this page, there is a speaker icon as a sound symbol and an orange bar. On this page, the user can adjust the sound of interactive multimedia according to the user's wishes. On this page there is also a back button and a home button to go to the main menu.

Figure 10 Options Page
Source: Author's Documentation

CONCLUSION

The design of Interactive Multimedia as a Learning Media about Pollution for Elementary School Students has succeeded in making alternative learning for students. Interactive multimedia is an effective educational solution in delivering material about pollution in an interesting and easy to understand manner. Interactive multimedia is a suitable learning media for elementary school students, because it looks attractive and students can interact directly with the learning media provided. With the approach of a combination of various media, such as visual, audio, and interaction, interactive multimedia is able to increase students' interest in learning, strengthen their understanding of the types of pollution and their impact on the environment and health. With the interactive multimedia as a learning media about pollution, students are expected to understand and implement the material that has been

explained into their daily life**.**

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