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Article

Development of Science Education Game "ECOLOGAME" Using Smart Apps Creator on Ecology and Biodiversity Materials

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ABSTRACT

The development of technology in the digital era allows changes in various aspects of life, including education. Education requires the integration of technology and communication in learning activities. One that can be done through the development of learning media in the form of educational games. The purpose of the study was to develop a science education game using Smart Apps Creator (SAC) on grade VII science material on ecology and biodiversity. The method used in this research is Research and Development (R&D) with Borg and Gall procedures and development, namely research and information collecting, planning, develop primary form of product, validation. The validation stage uses an instrument in the form of a questionnaire to determine the feasibility of the product with qualitative descriptive data analysis techniques. The results of media expert validation in the media efficiency aspect obtained a percentage of 87.5% and the visual design aspect of 82.9%. The results of material expert validation in the aspect of material relevance obtained a percentage of 57.1% and the aspect of content suitability of 48.6%. Based on the validation results, it shows that the Smart Apps Creator-based science education game on ecology and biodiversity material is feasible to proceed to the next stage with improvements.

INTRODUCTION

The world of technology cannot be separated from human life. Increasingly advanced technology has made enormous changes in human activities and habits. Currently, Indonesia is experiencing technological advances that we can visibly see (Hendro Setyo Wahyudi, 2014). Smartphones, Ipad, playbooks, tablet PCs and the like are increasingly rampant among the public and even every region has used this technology. Various needs require humans to utilize technology (Erri Wahyu Puspitarini, 2016). The existence of technological advances allows information to be easily accessed and disseminated.

Education is one of the important aspects that can realize and direct humans to think critically and idealistically. Education can also be referred to as the chain of life, if education does not run properly, it will greatly affect the life of a nation (Salsabila et al., 2020). The quality of education carried out will be closely related to the progress or failure of a nation. Education and social life have a reciprocal relationship, so education has a big role in delivering the nation's next generation in facing the times (Samsudin, 2019). Every time, there are changes in education. The increase in the components of the education system based on various findings and changes in the field creates a mindset of education experts, education managers and education observers who produce new theories. Especially with the current technological advances that affect the color of the changing meaning and understanding of education (Rahman et al., 2022).

The era of globalization has changed human perspectives and habits. In the world of education, educators must have the ability to integrate technology and communication into the learning process (Azis, 2019). Learning in the current era is more student-centered, no longer centered on educators or teachers. All aspects of life, especially the learning process, utilize digital media and innovations in it. In the past, a lot of learning was applied that focused on teacher explanations and student books or worksheets. However, technological advances have developed learning media that can be accessed easily. The learning media also varies so that students are not bored and fun. In addition, learning that uses varied learning media can make it easier for students to understand the material.

One of the technologies that are widely developed and in demand today is gadgets. The features in gadgets are also starting to change a lot. Cellphones, laptops and computers that were often found before, have now become more sophisticated. Year after year different versions are released and there are also more and more forms. Users of these gadgets also do not look at age, in the sense that from small children to the elderly can use gadgets as needed. Its utilization is also getting wider, gadgets that were originally used as a means of communication and information, can now be used as a medium in the world of education, especially in the learning process. Therefore, technology experts create various facilities for teachers to create interactive learning media.

Currently, one of the developments in science and technology is in the world of games. Often games are blamed as a medium for disturbing and destroying the student learning process, even though game technology can increase student interest and motivation to learn so that it is minimal boredom and more fun (Rusman et al., 2013). The existence of games in this digital era makes it easier for educators to convey information, especially the features provided in various forms and portions. The game designed as a learning media tool is expected to make students more enthusiastic in learning. Learning using this game is a type of game designed as education, better known as educational games.

Game is a term for playing or doing activities as a means to have fun either using the senses or not. This activity is more dominantly done at will, but still directed (Bayu, Pamungkas, 2013). Some experts explain that games are something that children absolutely do and can shape the personality of each child. Games are also a place to find satisfaction without the word win or lose, but it is also mentioned that games are characterized by the word win and lose (Ismail, 2009). There are many types of games such as maze games, board games, puzzle games, fighting games, racing games, educational games and many more (Ningsih, 2020).

Education is a learning process carried out both formally and non-formally which aims to educate, provide knowledge, and develop the potential contained in every human being, then realize the learning process better. Meanwhile, according to KBBI, education means education which is the process of changing the attitudes and behavior of a person or group in an effort to mature through teaching, training, processes, and ways of educating (Jambi City Education Office, 2020). Based on several definitions of games and education, science education games

can be defined as games that can help the learning process, especially in science subjects by providing fun when playing them and can increase student knowledge related to learning material. Educational games are a learning process that uses or without using tools but still provides pleasure to players and still contains educational elements and has educational value (Ningsih, 2020). One technology that can help in making science education games is Smart Apps Creator.

Smart Apps Creator (SAC) is an alternative that is suitable for use as learning media, especially in science subjects. Science lessons cannot be conveyed only through words (lectures) or text without any media support that can visualize the material being studied (Elviana & Julianto, 2022). Smart Apps Creator (SAC) is software that can be used as learning media, because SAC includes desktop software to create software that can be used on android and iOS mobile operating systems without the need for programming code. The results of the SAC application are in the form of apk, and exe format files (Andrianto et al., 2020).

In reality, science learning is less attractive to students, if the utilization of the media used is not optimal and only based on books (LKS) so that it can make students passive and easily bored. One of the subjects of science learning related to phenomena and problems that occur in the environment is ecology and biodiversity material (Maulida et al., 2023). This material examines the interaction of living things with the environment and environmental pollution. This study is part of the basic competencies 3.7 of science subjects for seventh grade junior high school students. Based on the results of research conducted by Dwi Rahmawaty, et al (2019) in one junior high school, when science lessons with this material took place as many as 46.67 percent of students felt bored because the teacher only used blackboard and LKS media. then when the media used was in the form of animation, 67 percent of students stated that they still felt bored because they did not understand the meaning of the animated video presented (Rahmawaty & Rachmadiarti, 2019).

Therefore, to create effective and efficient learning, a modern technology learning media is needed that can increase students' enthusiasm in learning. In addition to students getting a theory they also get a variety of learning media with the support of images, videos, and play experiences so that learning is not monotonous focused on student books and can create an innovative and fun learning atmosphere without making students feel confused by the concept of learning media. One of the innovations that can be developed as learning media is through educational games made with Smart Apps Creator (SAC) which is easy to make educational games without the need to go through programming. The purpose of this research is to find out how the development of science education games using Smart Apps Creator (SAC) software as a learning media on ecology and biodiversity material.

METHODS

The research was conducted from September to October 2023. The research conducted used the Research and Development (R&D) method with the Borg and Gall development approach which has ten stages, namely: (1) research and information collecting (2) planning (3) develop primary form of product (4) validation (5) revision of validation results (6) field trial (7) product refinement of field trial results (8) field implementation test (9) final product revition (10) Dissemination and implementation. The development of this science education game is only carried out until the fourth stage, namely validation.

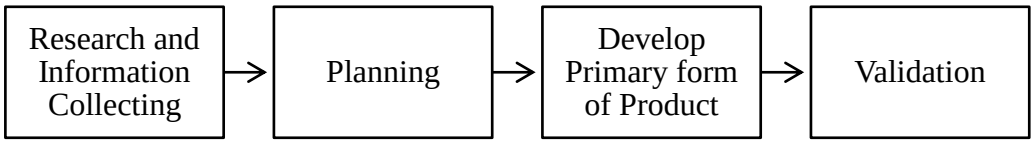

Figure 1. Research Phase

In the information search and collection stage, researchers collect information data to determine the needs of students and educators in carrying out the learning process through a step, namely literature study. Literature study is intended to find information related to ecology and biodiversity material which includes the study of the interaction of living things with the environment along with interactive learning media in accordance with technological advances.

In the planning stage, researchers designed the game starting from finding appropriate images and music, background, material, practice questions, answers and scoring. All program material needs are collected according to the needs and objectives in making the "ECOLOGAME" game. At the initial product development stage, researchers made the "ECOLOGAME" game according to the planning in the form of the concept of the "ECOLOGAME" game. The concept of science education games consists of appearance, style, and material requirements for the program. At this stage all multimedia elements are combined into one unit through the Smart Apps Creator (SAC) application.

The validation stage is carried out after the development stage to determine the level of validity of the development of the "ECOLOGAME" educational game. The validation stage is carried out by an expert, namely media experts and material experts. Media experts validate aspects of media efficiency and visual design, while material experts validate aspects of material relevance and content suitability. The data from the validation was then analyzed using descriptive qualitative by analyzing the data obtained from the validation results. The validation data obtained in the form of scores are processed to determine the percentage level of feasibility in each aspect using the formula in (1). The results of the calculation in the form of percentages are then used as a basis for determining the criteria for the feasibility level of science education game development, the criteria can be seen in Table 1.

$$Percentage\ (N) = \frac{Score\ obtained}{Total\ score} \times 100\% \qquad (1)$$

Table 1. Product Feasibility Criteria

Percentage Interval (%)	Category
81-100	Very Feasible
61-80	Feasible
41-60	Quite Feasible
21-40	Less Feasible
0-20	Not Feasible

Source: (Noer, 2021)

RESULTS AND DISCUSSION

The results of research related to the development of science education games "ECOLOGAME" in accordance with Table 2, show that in the aspect of application efficiency reached 87.5% which is included in the very feasible category. The visual design aspect reaches a percentage of 82.9% which is included in the very feasible category. The percentage in the aspect of material relevance reached 57.1% which is included in the category quite feasible. The aspect of content suitability reached a percentage of 48.6% which fell into the category of quite feasible. The efficiency of the application and visual design of the science education game "ECOLOGAME" is high, while the relevance of the material and the suitability of the content are low. Science education game "ECOLOGAME" should be equipped with learning outcomes (CP) so that it is clear what will be emphasized on ecology and biodiversity material. Instructions and commands on exercise questions must be clear so that they can be understood and not confusing. The writing of sentences on questions needs to be considered and addressed so that there are no errors in writing letters that can be confusing.

Table 2. Validation Result

No	Aspect	Percentage
1	Media Efficiency	87,5%
2	Visual Design	82,9%
3	Relevance of Material	57,1%
4	Content Suitability	48,6%

Media efficiency is an aspect that affects the usability of the "ECOLOGAME" science education game. Usability is related to the accuracy of using educational games in accordance with the material and student needs (Rahmi, 2019). Based on the results of validation by media experts, media efficiency is high because the science education game "ECOLOGAME" is simple in operation, and can be installed and run on android. Science education games are light enough to be installed because they only require relatively little space capacity. Science education game "ECOLOGAME" can be used anytime and anywhere with the internet or without the internet, but when not within the reach of the internet the material in the form of learning videos cannot be accessed. According to Ririn and Henny (2021), the use of android-based educational games can provide new experiences for students because they can be played with flexible time using smartphones (Windawati & Koeswanti, 2021). Learning videos in the science education game "ECOLOGAME" are able to support teacher explanations related to ecology and biodiversity material, so students are expected to be able to understand the material well through learning videos. Videos used in learning activities are able to generate motivation, train skills, and are able to improve perception, stimulation and develop problem-solving abilities in its users (Adnan et al., 2017). The impact of high application efficiency can provide convenience and comfort in operating the "ECOLOGAME" science education game, and allow anyone to operate it.

Visual design is an image in the form of design with the aim of informing the target through the sense of sight. Consideration of the game's visual design is one of the steps that can provide a more memorable and enjoyable gaming experience (Rafif & Patria, 2021). The language used is in the form of images, graphics, letters, signs, symbols, and so on. The visual design of the science education game "ECOLOGAME" is high because it has a variety of interesting and clear images. The sound chosen, both background sound and other additional sounds, is in accordance with the theme of educational games related to ecology and biodiversity, and the navigation buttons in science education games are attractive and function properly. The selection of colors in educational games is also suitable, making it possible to attract students' interest. Color has an important role because each color is able to communicate messages, strengthen the theme and atmosphere of the game being conveyed, if the right use is made (Rafif & Patria, 2021). The impact of high visual design can increase student interest in learning ecology and biodiversity material so that the content contained in the science education game "ECOLOGAME" can be captured properly, because through games during the learning process can improve student abilities (Lestari et al., 2015). According to Zaki, a good design is able to provide a strong interactive experience that is able to motivate and develop user skills (Zaki et al., 2020).

The relevance of the material is the relationship of the material contained based on the competencies to be achieved, the completeness of the material according to student needs, the adjustment of the material to the curriculum, and the suitability of the illustrations (Guterres et al., 2018). The relevance of the material is important for students because it will provide understanding to students regarding the abilities that students are expected to master in learning materials. Student understanding in ecology and biodiversity material is influenced by the quality of the material presented. In connection with the usefulness and relevance, it is necessary to know the needs of students and the problems faced by students in the learning process (Erfan et al., 2020). The relevance of the material presented in the developed science

education game is low because the science education game has not included learning outcomes that will provide information to students regarding aspects of mastery of the material that must be achieved. If the suitability of the material is high, it allows students to get an understanding that is in accordance with what is to be achieved in learning and encourages students to be able to relate the material to phenomena in the surrounding environment about ecology and biodiversity. The impact of the low relevance of the material is that it has not provided complete information to students so that students do not know the achievements that must be mastered based on the material presented in the "ECOLOGAME" science education game application. There needs to be an increase in the aspect of material relevance by adjusting the material to the current curriculum or implemented and also adjusted to the learning outcomes on ecology and biodiversity material. Providing a variety of materials is also needed, the material can be in the form of learning videos and readings so that students can learn from various reference sources. In accordance with the opinion of Dela and Julianto (2022) that the selection of material must be in accordance with the learning objectives achieved, systematic, the description of the material must be appropriate, must meet the needs of students, contextual, pay attention to the aspect of students' moral development, and arranged according to the scope systematically and sourced from books (Elviana & Julianto, 2022).

The suitability of the content in science education games is the accuracy and relationship between the exercise questions and the available material. The aspect of content suitability is very important because the content in the science education game "ECOLOGAME" is a form of manifestation of learning objectives and the development of science education games tailored to the needs of students in order to achieve goals. The suitability of the content in the science education game "ECOLOGAME" is still low because the exercise questions in the form of drag and drop presented do not have clear instructions and work instructions, causing confusion when playing it, and the exercise questions are difficult to understand. The exercise questions available in the game are still insufficient with the amount of material in the ecology and biodiversity chapter, and the difficulty level of the exercise questions is still relatively easy and less varied. Students will be more interested in games that are easy to play and have challenges in them (Putra et.al, 2018). A high percentage of content suitability can support the achievement of learning objectives and provide students with a good understanding of ecology and biodiversity material. Understanding of the material is obtained through practice questions that are presented in various forms and levels of difficulty. When the suitability of game content is low, it is unlikely that the learning objectives and the objectives of educational game development can be achieved. The low percentage of the suitability aspect of the content in the science education game "ECOLOGAME", then there needs to be an improvement made. Improvements can be made by providing more practice questions with various variations so that students are not bored in doing exercise questions that tend to be monotonous in the form of writing only. The level of difficulty of the exercise questions also needs to be developed, it can be made according to the level of Bloom's taxonomy of the cognitive domain ranging from C1 to C6, then the exercise questions are made with levels according to the level of difficulty. Through practice questions made according to Bloom's taxonomy of the cognitive domain, students will be able to think from low to high levels (HOTS) (Astuti, 2021). Practice questions that do not have work instructions are improved by adding instructions to each question to make it easier for students to work.

CONCLUSION

Based on the results of research on the Development of Science Educational Games "ECOLOGAME" using Smart Apps Creator on ecology and biodiversity material, four aspects were obtained with different values, namely media efficiency with a percentage of 87.5%, visual design with a percentage of 82.9%, material relevance with a percentage of 57.1%,

content suitability with a percentage of 48.6%. Based on this data, the efficiency and visual design aspects are included in the very feasible category while the material relevance and content suitability aspects are included in the feasible category. ECOLOGAME Science Education Game is feasible to be developed and continued at the next stage, but with revisions and improvements to aspects that are not yet appropriate such as the relevance of the material and the suitability of the content which is still relatively low.

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