






Game-based interactive multimedia to increase student creativity in physical education course


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Abstract

This research was conducted using the Research and Development method. The purpose of this study was to produce game-based interactive learning media that has a positive impact on improving students' creative thinking skills in physical education courses. Data collection was carried out in several stages, including expert validation, limited trials, and student response questionnaires. Based on the research results, multimedia interactive based on games is proven to improve the creative thinking skills of fourth-grade students at the elementary school of Tugu Utara 05, North Jakarta. Furthermore, multimedia game-based learning positively impacts student creativity use in education. This research contributes to the digitization of elementary schools through the use of technology in the teaching and learning process.

Keywords: creativity; game; game-based interactive media; learning media; multimedia; physical education.

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1. INTRODUCTION

Currently, digital-based learning transformation is becoming the primary strategy to face the challenges of the Industrial Revolution 4.0 era, where the process of transmitting information is speedy and covers a wide area (Baygin et al., 2016; Benešová & Tupa, 2017; Shahroom & Hussin, 2018; Svela et al., 2019; Oke & Fernandes, 2020; Batubara et al., 2022; Edwita et al., 2020; Hadi et al., 2022; Marini et al., 2020).

In the modern era like today, information technology develops according to human needs to assist humans in carrying out their activities. One is the number of technologies used to obtain information (Novaliendry et al., 2021; Marini et al., 2021; Ibrahim et al., 2020; Safitri, 2022). These technological advances have helped many industries to develop, including educational institutions. The importance of educational technology in teaching is because of its use for information and communication technology. Furthermore, it is said that students and teachers see the effectiveness of learning techniques (Morsidi et al., 2021; Marini et al., 2022; Nuraini et al., 2020; Rihatno et al., 2020; Safitri et al., 2022).

Technology entry into the world of education helps students get new information. Since the entry of the COVID-19 virus, the government has begun to establish learning at home, and educators in schools have also changed the education system so that it continues to run correctly. They were coupled with the Generation Alpha lifestyle in line with the advancement of the digital era. The development of digital technology has influenced them to adopt the use of digital mobile devices in their daily life routines, including their learning activities (Choi et al., 2018; Ciezaa & Lujan, 2018; Cerezoa et al., 2019; Sarifah et al., 2022; Herawati et al., 2022; Susanto et al., 2022; Umasih et al., 2020).

Therefore, educational institutions are turning to online learning to deliver learning materials effectively (Daniel, 2020). However, online learning is crucial because not all regions have adequate information and communication technology (Hermawan et al., 2018). Online learning has now become commonplace in the last few decades. Learning to teach using mobile devices such as smartphones and tablets is now a trend (Papadakis & Kalogiannakis, 2018; Becker et al., 2020). The benefits of high-quality education and learning are numerous (Kalogiannakis & Papadakis, 2018).

With the influence of technology, education in the future will be more relaxed and two-way, diverse, multi-disciplinary, and related to work productivity and competition. However, concepts and mechanisms of teaching and learning (education) based on concepts and mechanisms cannot be avoided (Novaliendry et al., 2020). Therefore, the development of this era is expected to make a more advanced generation.

Online learning is then known as E-learning. The effect of E-learning on transforming conventional education into digital form, both in terms of content and systems. The world community has widely accepted the concept of E-learning, as evidenced by the widespread implementation of E-learning in educational institutions involving schools, training, universities, and industrial institutions, including Cisco Systems, IBM, HP, Oracle, Etc. The essence of E-learning is a form of conventional learning that is translated into digital format through internet technology.

Depending on its importance, E-learning can be used in distance or traditional education. Therefore, it was developing a learning model that does not only present subject matter on the internet but needs to be considered logically and holds learning principles. Likewise, with a development design that is simple, personal, fast, and includes online evaluations aimed at supporting

lessons from both teachers and students as well as features that can be used easily in everyday life that can improve student learning outcomes (Baric et al., 2019; Amir et al., 2020).

Multimedia is one of the supporting devices that can be used in this case. This is because multimedia technology includes several synergistic aspects, including text, graphics, static images, animation, film, and sound (Suhairi et al., 2020). One form of multimedia that can be used in the learning process is PowerPoint. Based on existing research, game-based interactive multimedia is based on Visual Basic for educational games or as a container for multiple-choice questions and essays and presents information in several formats, including audio, video, text, animation, and pictures. The purpose of educational games in this research is to produce a ready media filled with material content and scenarios so that it can be exciting and increase students' learning motivation (Videnovik et al., 2023; Pozo-Sánchez et al., 2022).

By using educational games as learning media, especially in physical education learning, it is hoped that educators can be more professional in designing learning media. Educators only need a relatively short time to create exciting and interactive media so that students are more motivated to participate in teaching and learning activities. This is urgent because if this is not done, then the exam results and the process of delivering information to students will not be optimal.

These game-based interactive multimedia can overcome learning difficulties and increase motivation. Furthermore, using interactive multimedia in learning is also possible to improve the expected thinking skills (Chang & Yang 2023; Zhong, 2022). In general, the benefits that can be obtained through the use of interactive multimedia are that the learning process can be more exciting and more interactive, the amount of teaching time can be reduced, the quality of student learning can be improved, and the teaching and learning process can be carried out (Cyril et al., 2019). Moreover, the process can be done at any time and improve students' reasoning abilities (Herawati et al., 2022).

This study used game-based interactive multimedia media. This research was conducted based on the current needs of elementary school students accompanied by increasingly advanced technological developments. Therefore, this study focuses on using interactive multimedia based on games to improve the learning outcomes of elementary school students in grade 4.

The main questions asked in this study are as follows: "Is there any effect of game-based PPT media on improving student learning outcomes in grade 4 elementary school?". In addition, this research is an attempt to answer the following problems:

1. How to develop game-based interactive multimedia in physical education learning for elementary school?
2. Are there any differences between students after using this game-based interactive multimedia with the previous ones?

Our research uses interactive multimedia to do-based educational games. Next, we will describe the advantages of using multimedia interactive in education, including its impact on student competence and other aspects. In addition, character building by integrating various character values will also be presented related to improving student character.

1.1. Literature review

In this study, several literature reviews were discussed. This literature was selected based on its review of the most recent, relevant, and comprehensive publications related to the research questions posed in this study. In this literature review, we carried out critical analysis, synthesis, and

evaluation to produce a clear picture of the theme of this research and must be sure to reflect the current state of affairs.

1.1.1. Interactive multimedia

Play is a voluntary activity accompanied by feelings, excitement, and awareness (Sannikov et al., 2015). Play is humans' favorite way of learning and significantly impacts skills, cognition, and social (Nazar et al., 2020). With this, students will learn more efficiently. Although making good games for education is quite complicated and time-consuming, good games can help teachers improve student learning outcomes. In addition, the game can always attract people of all ages, especially elementary school-age children (Galustyan et al., 2019).

Various kinds and types of mobile learning games are multiplying, intending to provide convenience in facilitating children's learning in a fun way (Dore et al., 2019). This game makes it easier for children to understand learning and accomplishment with the use of points and achievement levels (Lomos et al., 2023). Currently, not a few children understand mobile learning games. However, the flexibility, efficiency, and various conveniences found in the mobile learning game application are considered to be able to answer all developmental problems and achieve the goals and demands of children's learning, with or without the help of adults around them (Pedro et al., 2018; Arifin et al., 2021).

Learning through this game is considered very fun. Because the types of games, playing games, action games, and other types of learning games, have a good impact on improving students' mindful learning and educational outcomes generally (Yeh et al., 2019; Gómez & Suárez 2021). In addition, students are also actively involved in the learning process. Regardless of the impact of children's character formation during and after playing mobile learning games. In the learning process, learning games have different learning outcomes and traditional games that previously existed in children's playing activities (Aisyah et al., 2020). This mobile learning game is adapted to the current era. Many platforms can be used when designing mobile-based games. One of them is interactive multimedia.

1.1.2. Creativity

Physical education is essential in elementary, middle, and high schools. In the 21st century, there are many developments in the field of technology, which means the teaching and learning process will change. Student's skills in the 21st century include critical thinking, creativity, communication, and collaboration (Karabatzaki et al., 2018).

Due to the demands of technological developments, 21st-century learning requires digital learning activities tailored to the needs of children (Boholano, 2017). Therefore, teaching and learning use e-learning models and mobile apps such as audio, video, animation, images, and text.

1.2. Purpose of the Study

The purpose of this study is to produce game-based interactive learning media that has a positive impact on improving students' creative thinking skills in physical education courses.

2. METHODS AND MATERIALS

This research method used the Research and Development with Analysis, Design, Development, and Evaluation (ADDIE) Model. This research was conducted for 18 elementary school students in the Koja sub-district, North Jakarta, as an experimental group and a group

2.1. Research design

This study used an experimental design which can be seen in Table 1. In the group experiment, student learning outcomes were applied using interactive multimedia based on game-based. In this study, there were differences in the treatment given to the experimental and control groups. There was no treatment for the control group. Table 1 presents the design of this study.

Table 1

Experimental Research Design

E	X	O ₁
C	-	O ₂

Notations:

E = Experimental

C = Control

O₁ = Experimental Posttest

O₂ = Control Posttest

X = Character building based on mobile-web

2.2. Participants

The research was conducted at North Tugu 05 elementary school in Koja, North Jakarta City, DKI Jakarta. This study took a random sample involving 80 students as the experimental group.

2.3. Data analysis

This study analyzes the data used with the Kolmogorov Smirnov for the normality test, the Levene's Test for homogeneity test, and the T-test for testing the hypothesis with a significance level of 0.05.

2.4. Procedure

The stages of this research include:

Game-based learning begins with the problems in fourth-grade students at the Koja District Elementary School. The problem is the decline in student grades which causes their creativity to decrease. This is caused by learning media that could be more attractive, making students bored quickly, and affecting the lesson's value. Therefore, game-based learning media is created, which is expected to enable students to overcome existing problems and help develop their creativity in understanding learning.

2.4.1. Design

This step begins with the preparation of data collection instruments for pre-test and post-test questions, which are carried out at the beginning and end of learning. Game-based interactive media were chosen according to the problems experienced by fourth-grade students.

The selection of media must consider the character of the students. Interactive media can attract students' attention to learning and remembering the material more efficiently, improving students' creative thinking skills in physical education subjects. For example, a pirate will guide students to search for treasure chests by answering my hero material questions. This games-based learning media is made lightly so that fourth graders can easily understand the material for my hero in the physical education course.

2.4.2. Development

Figure 1 is the main screen where the game will start. In the initial view, there is a pirate who will help the game run. On the right is a start screen for starting game-based learning media. Remember that this game is accompanied by supporting voices so that the atmosphere of playing games while learning is more pronounced. In Figure 2, there is an instruction to explain how to play this learning multimedia. On the right is a map showing the current position of the pirates.

Figure 1

Image display when starting the game



Figure 2

Instructions for starting the game



In Figure 3, there is a question display on the left to help the pirate to reach his destination. Click on question no one, and you will be directed to a question. When a question is answered, the pirate's position will change. When all the questions have been answered, it appears the pirate has found his treasure.

Figure 3

Question display



2.4.3. Implementation

In this study, the instrument used was a media feasibility assessment sheet based on learning games for physical education courses with validators, including material experts and media experts. The material experts' assessment instrument was developed following good visual media preparation. The assessment instrument for media experts was developed following the preparation of visual elements in good learning media, the preparation of good visual media, and the preparation of visual elements in good learning media.

After looking for the problems of fourth-grade students in understanding my hero material and testing game-based multimedia. After that, a validation test was carried out by three experts and a t-test before implementing students by fourth graders to find out the positive impact of game-based multimedia.

Table 3

Grid of Research Aspect Instruments for Material Experts

No	Assessment Aspect	Indicator	Number of Items
1	Validity	Content truth	3
		Material Updates	2
		Systematic and Logical	2
2	Level of Interest	Conformity of Material Formulation	2
3	Usefulness	Academic benefits	2
		Non-academic benefits	3
4	Learnability	Possibility to learn	2
5	interesting	Interest to learn	2
		Motivation	2

Table 4

Grid of instrument aspects for material experts

No	Assessment Aspect	Indicator	Number of Items
1	Simplicity	Layout	2
		Language	3
2		Integration between visual elements	5
3	Cohesiveness	Emphasis on visual elements	3
4	Emphasis	Visual element balance	2
5	Balance	Line visuals	2
6	Line	Shape visuals	2
7	Form	Space in design	2
8	Room	Texture in design	2
9	Texture	Coloring	2

3. RESULTS

Before implementing media. First, a pre-test was conducted to measure the student's ability to follow the indicators of creative thinking ability. After that, a questionnaire validation sheet for student responses to interactive media was prepared. The results of the T-test, which is presented in

Table 5, show that Sig. 0.071 less than 0.05, indicating that implementing game-based learning media can develop student creativity.

Table 5
Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	3.480	.071	-7.533	35	.000	-35.526	4.716	-45.100	-25.953
Equal variances not assumed			-7.640	28.937	.000	-35.526	4.650	-45.037	-26.015

The results confirm that applying game-based learning media can help students boost their creativity. This is the same as the study by Krisbiantoro (2020), confirming that gamification effectively enhances student creativity. Furthermore, managing a classroom based on a gamified teaching strategy can stimulate elementary school students' divergent thinking and tendency to be creative (Chen et al., 2020). Another study revealed a significantly positive relationship between the effectiveness of applying gamification in teaching and learning and the creative thinking of students at primary schools (Aljraiwi, 2019).

4. Conclusion

The purpose of this study was to produce game-based interactive learning media that has a positive impact on improving students' creative thinking skills in physical education courses. According to this study, game-based learning media positively impacts students. Based on the results of the pre-test and post-test shows that student learning outcomes have increased.

In addition, students understand learning more efficiently and positively impacts the development of learning values and creativity of fourth graders at North Tugu 05 Elementary School located in the district of Koja, North Jakarta City, DKI Jakarta.

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