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QR Code-Based Interactive E-Book in Increasing Interest in Physical Education

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ABSTRACT

Purpose: This research aims to determine the impact of QR Code-based interactive E-book learning media on enhancing student learning interest in physical education classes. **Methodology** This research was conducted for fourth-grade elementary school students in Srengseng Village, Kembangan, West Jakarta, with a sample taken randomly using the Slovin formula consisting of 73 students requested to respond to a questionnaire using experimental research methods. In addition, the researcher used the paired sample t-test to test the hypothesis and the Kolmogorov-Smirnov t-test to test normality in this study. **Findings** The results of the independent samples test show that the significance value with 2-tailed is 0.000 < 0.05; then, as the basis for decision-making in the independent sample T-test, it can be concluded that H0 is rejected, and Ha is accepted. Thus, there is a significant difference between the average student learning interest in the experimental and control groups. In other words, applying the treatment was given to the experimental group, and no treatment to the control group resulted in different learning attention to Physical learning Education. **Implications to Research and Practice** This research contributes to improving the competencies of elementary schools' digitalization to face globalization challenges.

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Introduction

Education is one of the basic needs of human beings which help them to develop their potential and grow into quality individuals. A quality education specifically enhances an individual's attitudes, knowledge and skills. Out of several domains that require quality inputs, physical education is one that needs the most enhancement through qualitative improvement of teaching methods, curriculum as well as learning platforms. Furthermore, physical education is closely related to good moral integrity and social adaptability of students (Hu & Prompanyo, 2021). A quality embedded course in physical education that develops good sports ethics and cooperative spirit is meaningful for students.

With the advent of technology and Information and Communication Technology (ICT), physical education has significantly been impacted from various perspectives (Mellati & Khademi, 2019). By using technology appropriately, for instance, students develop a higher-order thinking to achieve satisfactory learning outcomes (Hargittai, 2020). Digital media, in particular, has redefined the learning process, so it has become the task of schools, especially teachers, to prepare a highly mediated school world for students, but apart from teachers, parents at home can also shape students' experiences with digital media (Greve et al., 2022; Hammer, Scheiter, & Stürmer, 2021). In addition, technology and digital media have provided useful learning tools to increase students' interest and motivation (Chuang et al., 2019; Vorona-Slivinskaya, Bokov, & Li, 2020). With increased motivation, it is much easier for students to remain digital readiness with their knowledge, attitudes, and competencies and attain educational goals (Rusli et al., 2019; Sholikah & Harsono, 2021; Wahyuningsih, 2022).

The increasing presence of digital media has also shifted the path of physical education significantly towards achievement and excellence (Kucker, 2021). The rapid adoption of online learning educational technology has developed as an attractive way of learning. Therefore, physical education teachers are able to arouse students' attention to the subject with the use of a variety of media and varied learning resources because one aspect that affects the success of learning is the learning media (Gultom, Hutauruk, & Ginting, 2020; Miaz et al., 2019; Wang et al., 2022). In physical education, media is no longer an intermediary tool to physical outdoor practice (Sukmawati et al., 2020). Several new learning media has been introduced in physical education that arouse students' enthusiasm and interest in participating in physical activities (Criollo-C et al., 2021). The variety of media and digital-based learning resources that utilize technology support learning (Degner, Moser, & Lewalter, 2022). One such learning medium is electronic books, commonly called E-books.

Electronic books or E-books are books that are programmed into a computer. Electronic books are digital versions of books generally consisting of printed paper containing text or images (Wahyuningtyas, Bintartik, & Putra, 2020). As technology develops, E-books have developed into interactive E-books that do not only contain text and images. Interactive E-books have advantages over printed books; interactive E-books can be easily accessed via computers, laptops and even mobile phones; interactive E-books can also display a video image, as well as formative quizzes that can attract students' interest in learning (Ambarwati, Suyatna, & Ertikanto, 2019). The formative videos and quizzes in the E-book are presented in the form of a QR Code (quick-response code), which is accompanied by the procedure for using the QR Code.

There is a dearth of studies that have examined evolution of physical education courses in the digital media, particularly bearing QR code, as suggestive of their innovative developments of the 21st century. The reason for the lack of studies is probably unawareness and adopting conventional sources of learning and teaching. The current study aimed to fill this research gap by attempting to combine technology with physical education courses and focusing on the effect of using QR Code-based interactive E-books. The study also determined the extent to which the QR Code-based interactive E-book aroused interest in learning and provided conceptual mastery for students in physical education. The subjects of this study were fourth-grade elementary school students learning physical education course.

There was a dire need for such a study because it was critical to find out how the interest of students could be aroused in learning physical education subjects through the use of interactive E-books based on QR codes. It was also essential to motivate teachers to break away their habit of still using conventional mixed media and think creatively how to make use of various learning media in order to increase students' interest in learning. The QR Code-based interactive E-book media was expected to be used as an alternative learning media so that the learning process becomes more active and both teachers and students can take advantage of this QR Code-based interactive E-book as a technology-based learning media.

Literature Review

Visual media technology has transformed expressions, techniques and methodologies of both teaching and learning. This has changed the reading of books very diverse. In theory, technology has facilitated digital literacy by increasing cognitive enrichment, independent thinking, and other effective ways to learn information (Bateman, 2021; Lantz, Myers, & Wilson, 2020). Technology in digital form facilitates teachers in their teaching and enhances students' interest in learning in. For example, earlier text and images were displayed in conventional paper media; but after the use of electronic books, it has become easier not only to view the books with interest but also interact with them with expressions, which was difficult to achieve in paper media (Qiu et al., 2020). E-books, therefore, have proved a suitable learning medium in education.

Lim, Liu, and Hou (2020) carried out a study on undergraduate students and found that they preferred to use interactive E-books compared to printed textbooks. because there are many features in an E-book such as videos, interactive quizzes and a search feature that can be used to search for a word they want to read. In addition, E-books keep the interest of the students alive in reading due to its digital content which contributes to their growth. In another study, Harjono et al. (2020) found that various benefits of teaching material contained in QR Code-based interactive E-books, such as increasing motivation for novice readers, increasing children's understanding and literacy and enabling parents and teachers to provide an efficient and enjoyable learning experience. Besides, studies have found QR Code-based interactive E-books full of fun and excitement (Snezhko et al., 2022), which ensures their full involvement in the learning process (Maru et al., 2021). López-Escribano, Valverde-Montesino, and García-Ortega (2021) found the potential advantage of E-books that they are easily accessible and interactive for novice readers who are not yet able to decode text or are just starting to learn to decode. Furthermore, children with emergent literacy skills who cannot read now can explore E-books independently without adult assistance.

For some people, studying a subject may be an uninteresting and tedious activity, primarily if the subject being studied is complex to understand (Pranoto & Panggabean, 2019). Therefore, a teacher will often consider increasing a student's interest in learning. Interest in learning is an individual's tendency to get pleasure without coercion which can cause changes in knowledge, skills and behavior (Yusrizal, Hajar, & Tanjung, 2019). Students' interest in participating in a learning activity is vital in supporting the learning process. Therefore, students who have a high interest in learning the learning process can support the learning process for the better. There are several indicators of interest in learning, namely feelings of liking or pleasure, statements of preference, interest, a sense of interest in the awareness to learn without being asked, participating in learning activities, paying attention and acceptance. Students may desire to learn, but the external support provided by the teacher and the media in learning may also significantly impact student learning (Singh & Singh, 2021). Teachers can increase student interest in learning by creating good communication and relationship with students, creating an enthusiasm for learning, and using interactive and fun teaching materials and media.

Fun learning positively affects their psychological state, such as reducing stress levels, creating a feeling of comfort, and not burdening the schedule (Damanik & Hutasuhut, 2020). In addition, teachers can also use teaching methods according to the characteristics of students. Appropriate teaching methods can improve students' academic achievement and positive attitudes towards the subject (Sugano & Mamolo, 2021). Therefore, the teaching method is one of the crucial aspects of the student learning process.

Problem statement

The aforesaid review of studies has made it evident that E-books play an essential role in increasing students' reading interest and motivate them to learn because they make subjects more exciting and fuller of fun and allow students to study anytime and anywhere (ElAdl & Musawi, 2020). These studies also suggest that the application of technology in learning made a greater impact on students' cognitive aspects (Wang et al., 2022) because technology can make students interested in learning so that students' cognitive aspects can increase.

Various studies have proven that reading E-books can improve the quality of students' education; however, there are several obstacles in using E-books. For example, almost some students need their own devices, so it is challenging to access E-books; secondly, students often feel it inconvenient to stare at the monitor screen for a long time, as it might harm their eyes. A few students complain that that staring at the screen intensively can cause depression, higher stress levels, and fatigue. The current study attempted to find out what learning media could increase students' interest in learning and whether combining QR Code technology with interactive E-book learning media can address to the problems faced by students. The current study differs from previous studies as most studies in the past have only examined how E-book learning media increased students' learning motivation at school. Those studies did not link the E-books with the QR Code nor examined the relationship of technology in improving students' cognitive aspects. This study is going to be a pioneer in establishing the significance of E-books with QR code in physical education domain.

The study, therefore, framed two research objectives: (i) to develop QR Code-based interactive E-book media on the content of physical education; and (ii) to examine the impact of QR Code-based interactive E-book media on the learning interest of fourth-grade elementary school students on the content of physical education, to achieve these objectives, the research questions (RQ) were as follows: (1) How can QR Code-based interactive E-book media on the content of physical education be developed? (2) How do QR Code-based interactive E-book media affect the learning interest of fourth-grade elementary school students?

Methodology

- *Research Design*

This study adopted a quantitative research design that conducted several data distribution tests like normality test and Kolmogorov-Smirnov test and performed the experimental method of pretest-posttest design to test the effectiveness of the resulting product. The data was collected through Research and Development methods, particularly using the ADDIE model to develop an interactive E-book product based on a QR Code. Table 1 presents the pattern of one group pretest-posttest research design.

Table 1

Experimental Research Design

Groups	Pretest	Treatment	Posttest
Experiments	O_1	X	O_2

Description:
O_1: Pretest (initial test)
O_2: Posttest (final test)
X: QR Code-based interactive E-book

- *Research sample*

This study sample comprised teachers and other school officials working at the fourth-grade elementary school in Srengseng Village, Kembangan sub-district, West Jakarta, Indonesia. This study also involved fourth-grade elementary school students identified through random sample method using the Slovin formula. A total of 73 students formed the experimental group, who took the pretest and posttest before and after the experimental treatment.

- *Research Instrument and Procedure*

Questionnaires and semi structured interviews with teachers of fourth-grade elementary schools in the Srengseng village, Kembangan, West Jakarta were used to collect data. This study also used pretest and posttest instruments related to students' interest in learning physical education. The pretest measurement was carried out before giving the treatment, and then the researcher gave the treatment in the form of an interactive E-book based on a QR Code. After giving the treatment

experimentally, the posttest was given to the experimental group. The pretest results were compared with the experimental group's posttest results after being given treatment. Comparison between the group's pretest and posttest showed the effect of the QR Code-based interactive E-book treatment on learning. The grid of pretest and posttest statements about students' interest in learning physical education can be seen in Table 2 and Table 3.

Table 2

Grid table of pretest instruments of student interest in physical education

Aspect	Indicator	Total
Feeling of pleasure	Feel unhappy following physical education lessons.	1
	I need to be more motivated to take physical education lessons.	1
	Not actively asking during physical education lessons	1
	You need to pay attention to the explanation given by the teacher.	1
	I need help to clearly understand the physical education subject matter delivered by the teacher.	1
Participation	The learning media used by the teacher in delivering physical education material only sometimes helps to remember it.	1
	I feel physical education lessons are not useful	1
Attention	Unable to connect the content of physical education learning with things that have been seen, done, or thought about in everyday life.	1
	In physical education learning, there are no things that stimulate curiosity	1
	not happy to study physical education lessons at home	1

Table 3

Grid table of posttest instruments of student interest in physical education

Aspect	Indicator	Total
Feeling of pleasure	Enjoy participating in physical education learning	1
	Feel excited to participate in physical education learning	1
	Physical education is beneficial	1
	In physical education learning, many things stimulate curiosity	1
	Like to learn more about physical education learning at home	1
Participation	Actively ask questions during physical education learning	1
	Relate the content of physical education learning to things I have seen, done, or thought about in my daily life	1
Attention	Always pay attention to the explanations given by the teacher.	1
	Always pay attention to the explanations given by the teacher.	1
	The learning media used by the teacher in delivering physical education learning materials helps always remember it	1

The validation instruments from material and media experts to test the media's feasibility at this study's trial stage are shown in Table 4 and Table 5.

Table 4

Media validation instrument grid table

Aspect	Indicator	Total
Display	QR Code-based interactive E-book display layout/layout	1
Design	Compatibility of the contents of the QR Code-based interactive E-book display	1
	The colour combination in QR Code-based interactive E-book display	1
	Letters that are clear and easy to read	1
	Attractive QR Code-based interactive E-book display	1
E-book	6. Consistent content with a QR Code-based interactive E-book table of contents	1
Content Design	7. The use of letter variations (bold, italic, all capital, small capital, etc.) is not excessive	1
	8. Normal letter spacing	1
	9. The level of titles is clear and consistent	1
QR Code	The suitability of the content of the material on the QR Code	1
Based	Image conformance to QR Code	1
Interactive Multimedia	Video compatibility on QR Code	1
Ease of Use	QR Code based interactive E-book is easy to use	1
	The practicality of QR Code-based interactive E-book	1
	It can be used individually or in groups	1

Table 5

Material validation instrument grid table

Aspect	Indicator	Total
Content quality	The compatibility of the contents of the QR Code-based interactive E-book with the material of physical education.	1
	The compatibility of the contents of the QR Code-based interactive E-book with the learning objectives of physical education.	1
	Information in an interactive QR Code-based E-book provides new knowledge	1
	The material is accessible for students to understand	1
	Consistency of the material with the subject	1
	Quiz questions and evaluations are used both to test students' abilities	1
Language	The language used is communicative, effective and efficient	1
	The language used is easy for students to understand	1
	The sentences used do not have a double meaning	1
	Consistent in the use of terms, symbols, scientific names/foreign languages	1
Implementation	It can be used individually and in groups	1
	QR Code-based interactive E-book learning media according to the needs of students	1
	The practicality of an interactive QR Code based E-book	1
Aspects of QR	Quality QR Code in E-book	1
Code	Compatibility of the contents of the QR Code with the material	1

- *Data Analysis*

The data distribution normality test was carried out in statistical analysis, namely the Kolmogorov-Smirnov test. The basis for making normality test decisions was as follows: The residual value was usually distributed if the significance value > 0.05. If the significance value <0.05, the residual value was not normally distributed. In this study, inferential statistics for hypothesis testing using paired sample t-test was utilized. Conclusions from the hypothesis were made using criteria with a significance level of 0.05. The basis for decision-making in the paired sample t-test are as follows:

- *If the significance value (2-tailed) < 0.05, Ho is rejected, and Ha is accepted.*
- *If the significance value (2-tailed) > 0.05, Ho is accepted, and Ha is rejected.*

Data measurement analysis technique was used to determine media and material experts' responses using a Likert scale with the questionnaire score category, as shown in Table 6.

Table 6

Validation Score-Category Media experts and material experts

Scoring Scale	Alternative Answer
5	Very good
4	Well
3	Pretty good
2	Not Good
1	Not very good

The feasibility test of the QR Code-based interactive E-book learning media was analyzed with a percentage rating scale. The validation criteria used in the validity of the interactive E-book learning media based on QR Code research are presented in Table 7.

Table 7

Media eligibility criteria based on the rating scale

No.	Percentage of Scoring Result	Eligibility criteria
1	86% - 100%	Very Worthy
2	51% - 85%	Worthy
3	26% - 50%	Less Worthy
4	0% - 25%	Not feasible

Results

This research aimed at developing a QR Code-based interactive E-book for the students of the fourth-grade elementary school in Srengseng Village, Kembangan sub-district, West Jakarta, Indonesia. After a careful examination of needs and requirements and introduction of the ADDIE steps, a plan of QR Code-based interactive E-book was made. This E-book learning media developed by integrating QR Code technology was accessible in audio-visual form and contained material about small ball games. In this E-book, students could access several pictures, learning videos, and interactive quizzes directly by a QR Code. The cover of the E-book

displayed small ball games that informed students what material they would be studying using the QR Code-based in this interactive E-book. In addition, the book displayed the class description, author's name and institution. Inside the book was the table of contents, introduction, and instructions for use and lessons.

The QR Code-based interactive E-book had the title page for each lesson, which was meant to inform students about the subject and material they would study in each lesson. In addition, there were pictures of small ball games to attract students' attention to this E-book. The E-book started with Lesson 1 which dealt with the definition of elementary concepts followed by a map of the distribution of kingdoms in the Indonesian archipelago. After this introduction, the rest of the material followed.

At the beginning of each lesson in this E-book, there was a QR Code that could be scanned to display videos related to one of the small ball games. In addition, after students had understood the lesson's content, they could access the page containing assessment questions via a QR Code. The assessment questions dealt with small ball games specifically related to the field dimensions, equipment, rules of games, and the fundamental techniques of small ball games. This assessment section was designed like an interactive quiz to increase students' interest in learning. It was felt that the use of the QR Code for interactive activities was making students feel excited and happy. This E-book media containing physical education learning material for the small ball games in fourth-grade elementary school students were tested by two experts, namely media experts and material experts, who validated the developed QR Code-based interactive E-book media. The results of media expert validation can be seen in Table 8.

Table 8

Validation media

Media expert validation							
No.	**Aspect**	**Indicator**	**Score**	**Total score**	**Maximum Score**	**Percentage (%)**	**Validation criteria**
1	Display Design	1	5	21	25	84	Worthy
		2	5				
		3	4				
		4	5				
		5	5				
2	E-book Content Design	6	5	19	20	95	Very Worthy
		7	4				
		8	5				
		9	5				
3	QR Code Based Interactive Multimedia	10	4	14	15	93.3	Very Worthy
		11	5				
		12	5				
4	Ease of Use	13	5	13	15	86.7	Very Worthy
		14	5				
		15	3				
Percentage of all aspects						89.3	
Criteria for validation of all aspects						Very Worthy	

The media expert validation results of the QR Code-based interactive E-book show a decent result. This is evident in the average percentage of 89.3%, suggesting a very worthy achievements obtained from 4 aspects representing 15 questions in the questionnaire given from the validator to the QR Code-based interactive E-book media.

The assessment of the validity of learning materials of the interactive QR Code-based E-book by the material expert is shown in Table 9.

Table 9

Validation material

Material expert validation							
No.	**Aspect**	**Indicator**	**Score**	**Total score**	**Maximum Score**	**Percentage (%)**	**Validation criteria**
1	Content quality	1	5	27	30	90	Very Worthy
		2	5				
		3	5				
		4	4				
		5	3				
		6	5				
2	Language	7	5	18	20	90	Very Worthy
		8	5				
		9	4				
		10	4				
3	Implementation	11	4	13	15	86,6	Very Worthy
		12	4				
		13	5				
4	Aspects of QR Code	14	5	10	10	100	Very Worthy
		15	5				
Percentage of all aspects						90,6	
Criteria for validation of all aspects						Very Worthy	

The assessment by the material expert on the QR Code-based interactive E-book media shows proper interpretation. This is evident in the average percentage of 90.6 achievement obtained from 4 aspects representing 15 questions in the questionnaire given from the validator to the material on the QR Code-based interactive E-book media.

After getting a valid score from the media and material experts, the QR Code-based interactive E-book media was tested on a random sample involving 73 students from four elementary schools as the experimental group. Before the trial, students were given a pretest questionnaire to test their interest in learning. After the media trial, students were given a posttest questionnaire again to test their interest in learning. The results of the pretest-posttest test data analysis of students' interest in learning are revealed in the Kolmogorov-Smirnov test and the paired sample test presented in Tables 10 and 11.

Table 10

Kolmogorov-Smirnov Test

N= 73		Unstandardized Residual
Normal Parameters	Mean	.000
	Std. Deviation	.569
Most Extreme Differences	Absolute	.101
	Positive	.101
	Negative	-.101
Test Statistic		.101
Asymp. Sig. (2-tailed)		.063

The normality test using the Kolmogorov-Smirnov test determined whether the residual value was adequately distributed. Based on the results of the normality test shown in Table 10, it is known that the significance value is 0.063 > 0.05; based on making normality test decisions, if the significance value is> 0.05, then the residual value is adequately distributed. Therefore, the residual value of the interest in learning for grade 4 elementary school students in the Srengseng Village, Kembangan, West Jakarta, is adequately distributed.

Table 11

Paired Sample Statistics

		Mean	N	Std. Deviation	Standard Error Mean
Pair 1	Pretest	57.12	73	12.074	1.413
	Posttest	84.93	73	10.688	1.251

The results of the paired sample t-test reveal that the average value of the pretest = was 57.12, less than the average value of the posttest = 84.93. Therefore, the average value of the posttest after testing the interactive E-book-based learning media QR Code was better than that of the pretest before testing the QR Code-based interactive E-book learning media.

Table 12

Independent samples test

Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
			Lower	Upper			
-27.808	13.667	1.600	-30.997	-24.619	-17.384	72	.000

In Table 12, the significance value (2-tailed) is 0.000 < 0.05, based on decision-making in the paired sample t-test. If the significance value (2-tailed) < 0.05, Ho is rejected, and Ha is accepted. This suggests that QR code-based interactive e-books can improve student interest in physical education courses.

Discussion

This end-result of this study was an interactive E-book learning media based on QR Code for fourth-grade elementary school students in physical education learning, which contained material on games and sports, with lesson comprising in both audio and visual form. This QR Code-based interactive E-book was designed through a website or application called Canva and packaged in PDF or Flipbook form that can be accessed via a link. This QR Code-based interactive E-book learning media contained images and videos related to games and sports, for example, pictures of the field, equipment, game rules, basic techniques of softball, table tennis, football, and volleyball and games videos of softball, table tennis, football, and volleyball as well as interactive quizzes about games and sports. In addition, images, videos, and interactive quizzes contained in QR Code-based E-books also could be accessed via a QR Code.

The creation of this E-book learning media based on QR Code for fourth-grade elementary school students in physical education learning was based on needs analysis. A need was felt that students required a more interesting and fun-loving learning media that could also be used as a teaching media for physical education learning. The students reported boredom during the lesson hours in the classroom of physical education learning. It was also felt that the teachers were not using any technology assisted media that could also be interactive. It was also felt that teachers used conventional books and practice questions that did not foster students' interest in learning physical education material, so learning was ineffective.

This QR Code-based interactive E-book learning media was developed using the ADDIE approach, a R&D model of five stages, namely analysis, design, development, implementation and evaluation. In addition, one media expert and one material expert also validated this QR Code-based interactive E-book learning media. Both experts evaluated several aspects of its design, content, QR Code based interactive multimedia, and ease of use. The following account illustrates in detail each of these five stages.

- *Analyze*

The 'Analyze' stage was carried out by seeking information about students' interest in learning and the learning media used by teachers in physical education learning. The data collection techniques included a questionnaire and an interview with the teachers of fourth-grade elementary schools in the Srengseng village, Kembangan, West Jakarta. In line with the results of the questionnaire, it was discovered that physical education learning process, on average, still used the media in the form of books, and the exercises provided did not foster student interest in learning physical education material, so learning became ineffective. It was analyzed that students felt bored when physical education learning process would take place, mainly because the media used by teachers during the physical education learning process were less technologically advanced and developed, and hence the media was not interactive. Likewise, the informants in the interview also opined that the learning media applied for fourth-grade elementary school students failed to reduce boredom and could not make learning effective. Hence, a technology-based media such as a QR Code-based interactive E-book should be included in the form of text as well as audio-visual material. Such a media can help share much information related to games and sports

with students in physical education learning. In addition, there should be exercises in the form of interactive quizzes. In that way, students can become interested in physical education, and the learning process becomes more inter-active.

- *Design*

During the design stage of making interactive E-book learning media based on QR codes, the needs-analysis of the previous stage regarding the material related to games and sports was utilized. This helped in formulating learning objective indicators for fourth-grade elementary school students and design the material in physical education courses. After formulating objectives, the next step was to make a storyboard to describe the layout of the material in the scrapbook, determine illustrations related to games and sports involving pictures of the field, sports equipment, game rules, basic techniques of softball, table tennis, football, and volleyball and games videos of softball, table tennis, football, and volleyball as well as interactive quizzes about games and sports. Finally, the last step was to prepare interactive quizzes in each learning chapter and prepare an evaluation question that students can access through a QR Code.

- *Development*

At the development stage of making an interactive E-book learning media based on QR Code for the physical education learning of fourth-grade elementary school, there were again a few steps. The first step was the preparation of the Canva application, which was used to create interactive learning media. The complementary media content was prepared namely YouTube video links and illustrated images of physical education concepts. These videos and images can be accessed by students via a QR Code. The second step was to develop the packaging material and to make it compatible with the complementary media content prepared in the previous step. The third step was to re-check the completeness of the material, accuracy of the illustration selection, the video material's suitability, quiz questions, and evaluation questions with the material in the QR Code-based interactive E-book learning media related to games and sports.

- *Implementation*

During the implementation stage of preparing a QR Code-based Scrapbook learning media in physical education learning material for the fourth grade of elementary school, the E-book media designed and developed in the previous 2 stages was tested by one media expert and one material experts, who validated the E-book as valid and reliable. The media validation also involved evaluating the questionnaires distributed to the respondents. The results of the validation of these experts were used to improve the product of interactive E-book learning media based on the QR Code. After getting a valid score from each expert for the media and material, the QR Code-based interactive E-book media was tested on a random sample involving 73 students from four elementary schools as the experimental group. Before the trial, students were given a pretest questionnaire on interest in learning; after the media intervention, the students were given a posttest questionnaire on interest in learning. The results of this implementation data on 73 students proved that the data were normally distributed, and the average post-test results were more significant than the

pretest results. Therefore, it was proved that using interactive E-book learning media based on QR codes positively increased the learning interest of fourth-grade elementary school students.

- *Evaluation*

The evaluation stage again involved a media expert and a material expert on physical education learning materials for fourth-grade elementary school students. The objective of this evaluation stage was to improve the interactive E-book learning media product based on the QR Code that had been developed and implemented. The evaluation aspects included content quality, language, implementation, and aspects of the QR Code. The results obtained from the media expert validation test were 89.3% with a very decent category, and the material expert validation test percentage was 90.6% with very decent criteria. These evaluation results indicated that the QR Code-based interactive E-book learning media could be used and applied as a learning medium in elementary schools.

The use of ADDIE model in the whole process of making a QR Code-based E-book learning media proved that the material related to games and sports cannot be observed directly in the learning process due to the lack of variety of teachers in choosing learning media and more explaining physical education material using the lecture method. This aligns with another empirical study which found that learning media is interactive and designed for individual and group learning, but the teacher must provide understanding to help accelerate student understanding (Susanto et al., 2022). This entails that teachers must guide students in accessing material through an interactive QR Code-based E-book to optimize learning. The media also should also have a quiz for each sub-learning and evaluation question that students can access through the QR Code, which will later be displayed on a website, namely world wall and quizzes. The quizzes and evaluation questions aim to evaluate student interest in physical education courses.

Applying QR Code-based interactive E-books as learning media in schools can increase student interest in learning and improve students' ability to use digital media. This is in line with a study which found that QR Code-based interactive E-book learning media can deliver audio and visual material and is equipped with a QR Code to access videos and quizzes (Wahyuningtyas et al., 2020). Similarly, another study stated that the media was an innovation with an attractive media design that gives the students new learning experiences in using digital media and further increases student interest in participating in the teaching-learning process (ElAdl & Musawi, 2020).

Conclusion and Recommendations

The conclusion of this study is based on the analysis of the needs of fourth-grade elementary school students in Serengseng Village, Kembangan District, West Jakarta, which is related to interest in learning physical education subjects, especially on the material of small ball games, and an appropriate use of the interactive E-book based on QR Code. This media used in this study was proven valid and practical to use so that elementary school teachers could use it as a medium in physical education learning. The application of QR Code-based interactive E-book media affected students' interest in physical education learning because teachers can guide students

to access the material of games and sports through the QR Code contained in the QR Code-based interactive E-book Media. Incorporating technology in the form of a QR Code can be a unique attraction for students in accessing interactive QR Code-based E-books.

Based on the data from the posttest results of students' interest in learning, it is known that the experimental treatment of interactive E-book media based on QR codes is greater than the pretest of students' interest in learning before learning. Applying QR Code-based interactive E-book media increases elementary school students' learning interest in the Srengseng sub-district, Kembangan sub-district, and West Jakarta. However, the limitation of this study is that some students may not have access to smartphones or other devices necessary to use the QR codes.

This study recommends that QR Code-based interactive E-book media should be implemented as physical education learning media to increase the learning interest of elementary school students in the broader area, not only in the Srengseng sub-district, Kembangan district, West Jakarta but in all fourth-grade elementary schools.

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