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## Quick Response Code in Engklek Traditional Games: Facilitating Challenging and Enjoyable Science Learning in Elementary School

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**Abstract:**

Pembelajaran IPA di sekolah dasar memerlukan media pembelajaran yang memfasilitasi siswa untuk mengeksplorasi ilmu pengetahuan dengan cara yang menyenangkan melalui permainan. Salah satunya melalui permainan tradisional Engklek yang mengintegrasikan teknologi. Untuk itu, penelitian ini bertujuan untuk mengembangkan permainan tradisional Engklek yang dilengkapi QR-Code untuk pembelajaran IPA materi fotosintesis kelas IV di sekolah dasar. Penelitian menggunakan model pengembangan ADDIE (Analysis, Design, Development, Implementation, and Evaluation). Data dikumpulkan melalui observasi, wawancara, angket untuk uji validasi dan praktikalitas. Data dianalisis secara deskriptif dan kuantitatif. Hasil penelitian ini menunjukkan bahwa dari perspektif guru dan siswa, diperlukan media pembelajaran materi fotosintesis yang dapat memfasilitasi aktivitas dan keterlibatan siswa. Produk telah berhasil dikembangkan menggunakan Model ADDIE, namun sampai tahap development. Karakteristik media ini berupa spanduk permainan berukuran 200 x 400 cm dengan model gunung. Rancangan permainan Engklek dilengkapi kartu QR-Code yang digunakan sebagai objek penyajian materi berupa video animasi, grafik, tabel bacaan dan soal kuis. Berdasarkan uji validitas oleh ahli materi dan ahli media, produk telah dikategorikan sangat layak. Berdasarkan uji praktikalitas, media juga telah dinyatakan sangat praktis baik oleh guru maupun siswa. Dengan demikian, permainan tradisional Engklek yang dilengkapi QR-Code dapat direkomendasikan untuk digunakan dalam pembelajaran IPA materi fotosintesis kelas IV SD.

*Science learning in elementary schools requires learning media that facilitate students to explore knowledge in a fun way through games. One of them is through the Engklek traditional games that integrates technology. For this reason, this study aims to develop Engklek traditional games equipped with QR-Code for science learning of photosynthesis material for grade 4th in elementary schools. This study uses the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model. Data was collected through observation, interviews, questionnaires for validation and practicality tests. Data were analyzed descriptively and quantitatively. The results of this study indicate that from the perspective of teachers and students, media are needed to learn photosynthesis material that can facilitate student activity and involvement. This product was developed using the ADDIE stage, which only includes the analysis, design, and development stages. The characteristics of this media are that it is a banner measuring 200 x 400 cm with a mountain-model. Engklek game design equipped with a QR-Code card, which is used as an object for presenting material in the form of animated videos, charts, reading*



*tables and quiz questions. Based on the validity test by material experts and media experts, the product has been categorized as very feasible. Based on the practicality test, the media has also been declared very practical by both teachers and students. Thus, the Engklek traditional games equipped with QR-Code can be recommended for use in science learning of photosynthesis material for grade 4th in elementary schools.*

**Keywords:** *engklek; QR-Code; science learning; traditional games*

## **INTRODUCTION**

Science learning in elementary schools provides students with the opportunity to gain real experience in the process of developing a basic understanding of knowledge about nature. Therefore, students should be directed to explore and investigate concepts, facts, and phenomena in the surrounding environment. Science learning in elementary schools is not only intended to provide introductory activities and learning about concepts, let alone just memorizing concepts (Sari, 2021). However, it is used in order to help improve the development of potential in students, one of which is the ability to explore knowledge through various methods. This helps them understand how humans interact with nature. From this understanding, students will be able to identify the problems they face and find solutions to their problems.

In fact, the science learning process in the independent curriculum is still considered difficult for students to understand. Pertiwi, Dyah Lingga, 2023 stated that the main emphasis in the science learning process is on providing direct experience that aims to develop skills in studying and understanding natural media scientifically. Therefore, science is often considered a difficult subject to understand because much of the material requires reasoning, memorization, and deep understanding. Various literature shows that to overcome students' difficulties in understanding science material, one way is to utilize learning media when designing the science learning process (Arief, 2021). The use of media in science teaching and learning activities can help students better understand the material presented by teachers. The use of media in learning will make learning more effective because it makes students more motivated to learn, increases their understanding of the material, and makes the material more interesting (Arief, 2021).

Based on various literature, one form of media that can be an alternative to science learning in elementary schools is through traditional games, for example Engklek, which can encourage increased motivation, interest, learning atmosphere and science learning outcomes of elementary school students (Hariyono et al., 2023; Kholidah & Sari, 2023; Kusumaningsih & Suryanti, 2019; Lestari & Dia Indah Sari, 2024; Mita, 2022; Riyadi et al., 2024). The results of these studies confirm that the Engklek traditional games media is able to create an atmosphere of learning while playing, thereby influencing student involvement in the learning process.

However, research that has been conducted on the implementation of the Engklek game in elementary schools is still traditional. For some students, it feels boring and not challenging enough to play repeatedly. The form of questions and learning activities when playing Engklek is not varied enough. In terms of the learning process, students are not facilitated enough to carry out in-depth activities related to the material being studied. The nature is only to provide questions or answers as part of the Engklek game. Whereas in science learning, for example, photosynthesis material in plants, not only requires students' knowledge of the concept and its components, but students need to explore the process. If it is only question and answer, it will



only encourage memorization so that students do not explore the process of photosynthesis itself. This is a research gap that needs to be followed up through research.

Based on the literature, there are various strategies to make traditional games more challenging when used in the learning process, especially facilitating students to explore the material further, for example, Quick Respond Code (QR-Code). QR-Code can be used to explore the material by connecting to digital resources such as videos, articles, or other additional materials, allowing students to learn further and expand their knowledge related to the topic being studied (MEQR, 2025). Various studies have examined the integration of QR-Code for learning media (Rahmawati et al., 2024), worksheets (Ningrum, 2024), teaching materials (Fitriyan et al., 2023; Palupi et al., 2022), encyclopedias (Avioleta et al., 2021), card games (Izzati, 2022).

However, from the various existing studies, not many have developed Engklek game media integrated with QR-Code. This characteristic is what distinguishes the Engklek traditional games media developed by researchers from previous researchers. Thus, there needs to be development research that aims to develop Engklek traditional games media integrated with QR-Code in science learning of photosynthesis material. The research questions that will be answered in this study are as follows. First, how is the analysis of needs, design and development of Engklek traditional games equipped with QR-Code for science learning of photosynthesis material for grade 4th in Elementary Schools? Second, how is the media valid and practical?

## **METODE**

This research is development research (R&D) and uses the Analyze, Design, Develop, Implement and Evaluate (ADDIE) development model, which is very suitable for various types of product development such as strategies, learning methods, media and teaching materials (Branch, 2009; Hidayat & Muhamad, 2021; Sugiyono, 2013). The ADDIE development model has the advantage of being dynamic and flexible and can be adjusted to the needs of researchers in their research. Due to limited funds and time, this study only uses three stages, namely, Analyze, Design, and Develop.

The participants of this study were fourth-grade students in three elementary schools (SDN 12, 28, 51) in Parepare City, South Sulawesi, Indonesia, along with three teachers. Qualitative and quantitative data were collected simultaneously and analyzed to complement the research results. The three stages include conducting initial observations to obtain data on media needs analysis, materials, and content. Then, data collection will be done through observation, interviews, and filling out questionnaires on the needs of Engklek traditional games media, initial media design, design validation by experts, design revisions, small group trials for practicality tests, and final products.

The research instruments used in this study consisted of observation guidelines, interview guidelines aimed at analyzing the needs of learning media, media needs analysis questionnaires, validation guidelines for experts to determine the validity of the media and questionnaires aimed at users. The observation guideline instrument was compiled using indicators of media use during science learning and student learning involvement during science learning. Interview guidelines were compiled using indicators; learning media was needed. Validation guidelines were compiled to assess the feasibility of material aspects, media quality aspects, and language aspects of the guide on how to play the traditional Engklek game.



The data analysis techniques used in this study are qualitative and quantitative. Qualitative analysis describes the results of observations, interviews, validator suggestions, and documentation records at the time of implementation. Data are analyzed descriptively and qualitatively; some suggestions will be used to improve the product at the revision stage. Quantitative analysis describes the quality of the product based on the assessment of experts/validators, teachers and students. The feasibility and practicality of the product are assessed by filling out the validation questionnaire and the practicality questionnaire. The results of the questionnaire are then given a score and categorized based on the rubric and criteria that have been determined. The criteria for the validity and practicality of the product can be seen in the following table.

Table 1. Criteria for Validity and Practicality of the Product

Score	Product Validity Category	Product Practicality Category
81% - 100 %	Very Feasible	Very Practical
61% - 80%	Feasible	Practical
41% - 60%	Quite Feasible	Quite Practical
21% - 40%	Not Feasible	Less Practical
0% - 20%	Not Feasible	Not Practical

## RESULT

The results section will present data from the results of development research in an effort to answer all research questions; thus, this section consists of two sections.

### Needs Analysis, Product Design and Development

Analysis of the needs of science learning media for grade 4th was conducted through observation, interviews with teachers, and filling out student questionnaires at the SDN 12, 28, and 51 Parepare. The results of the observation showed that the use of teaching media was still limited, dominated by text in slide and textbooks at SDN 12, animated videos at SDN 28, and simple concrete media at SDN 51. Interviews with teachers confirmed that technology-based media, such as traditional games, were still minimally used, even though the school had Wi-Fi network facilities and the level of internet access for students was quite high, opening up opportunities for innovation in QR-Code-based learning media such as the traditional game Engklek.

In terms of needs, teachers expect media that is practical, economical, easy to carry, in accordance with the objectives of the material, and able to activate students. Meanwhile, students showed greater interest in game-based learning and group work. Additional data collection through questionnaires on students and interviews with teachers emphasized the importance of developing interactive science learning media that activate students. The potential for implementing traditional game media based on QR-Code is possible in the three schools with the support of technology access and permission to use devices in learning. Thus, it is concluded that a Engklek traditional games media integrated with QR-Code is needed for science learning media. The following chart briefly describes the results of the needs analysis.

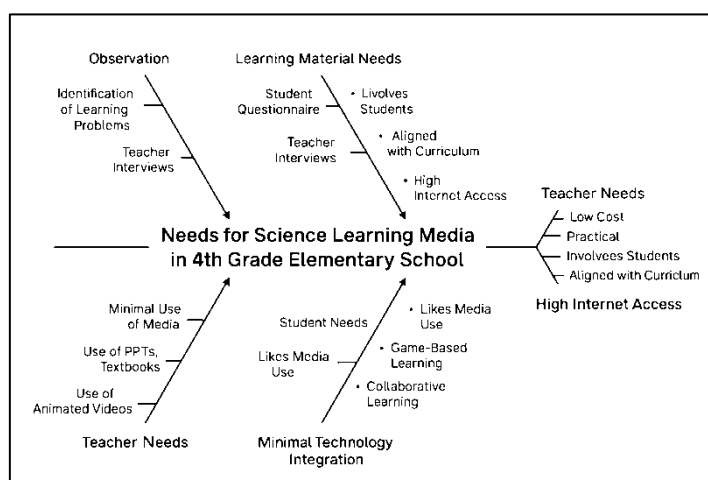


Figure 1. The Results Of The Needs Analysis

Furthermore, the development of the Engklek traditional games media is designed in the form of a banner media measuring 200 x 400 cm with a mountain-style Engklek game model design. The design of the Engklek traditional games banner media is also equipped with additional elements, such as images of children playing Engklek and images of rainbows and the sun, to make the media display more attractive.

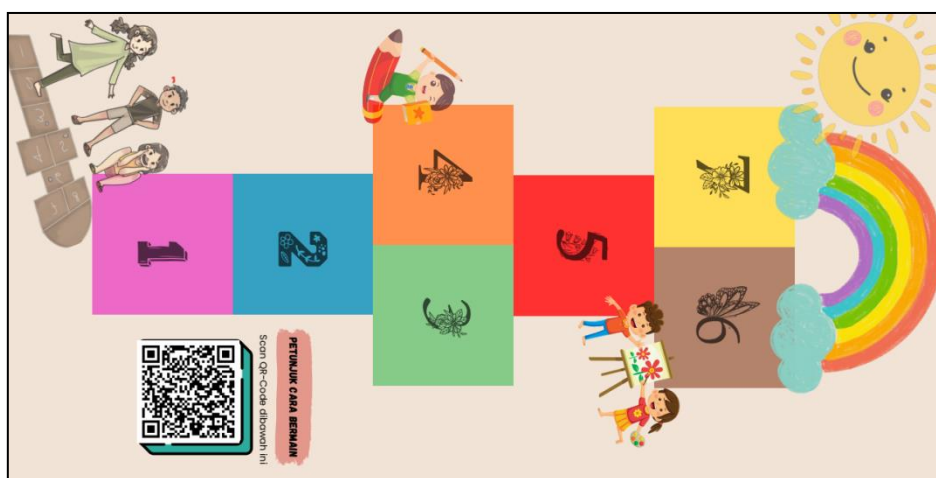


Figure 2. Engklek Traditional Games Area

The Engklek traditional games media is also equipped with a QR-Code card that functions as a presentation object for the material where the form of presentation of the material varies from animated videos, reading tables, and charts, and there are also evaluative questions presented in the form of Quizzis. In addition to the QR-Code card, this media is also equipped with a Gacu, made of wood with a diameter of 2cm. In addition to the material and quizzes presented in the QR-Code display, there is also a media usage guidebook that can be accessed via the QR-Code designed on the banner media. After going through the design process, Engklek traditional games media integrated with QR-Code for science learning media for photosynthesis material was realized with a physical form, as shown in the following figure.





Figure 3. QR-Code Card

Traditional Engklek game media integrated with QR-Code is used in science learning using the Engklek game system in general. However, in the game, some steps require students to explore photosynthesis material further through videos, readings, infographics, quizzes, and so on. Briefly, here is a diagram of the game steps.

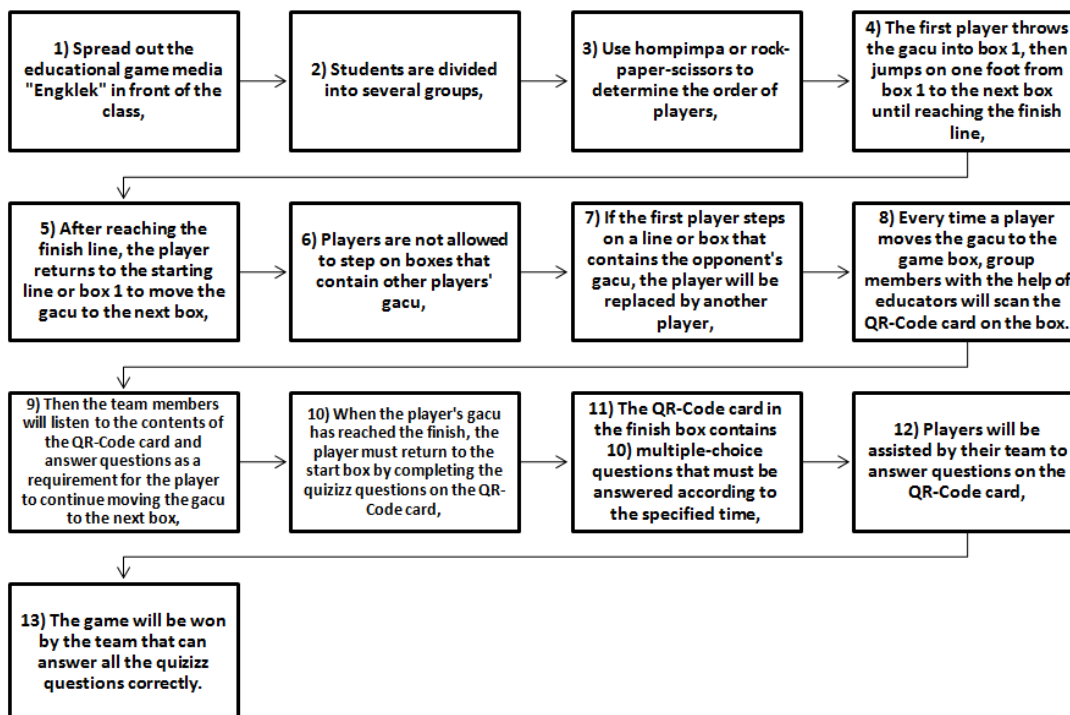


Figure 4. Diagram Of The Game Steps

**Product Validity and Practicality Test**

Media experts and material experts have conducted a validation test of the Engklek traditional gamesmedia product integrated with QR-Code. The aim is to obtain an assessment so that the media can be said to be valid or feasible for use in the learning process, as well as to determine the feasibility, shortcomings and advantages of the media developed. The assessment carried out refers to the assessment instrument that the researcher has created in the form of an answer range of 1 to a score of 4. Furthermore, the total score obtained is calculated by finding the average value. The score obtained is converted into a percentage of the eligibility criteria. The following is a summary of the validation results.

Table 2. Recapitulation Of Validation Results

No	Rated Aspect	Media Expert Assessment	Material Expert Assessment
1.	Material aspects	3,8	4
2.	Aspects of media quality	3,7	4
3.	Linguistic aspects	4	3,7
	Total Score	11,5	11,7
	Overall score average	3,8	3,9
	Percentage	95%	97,5%
	Category	Very Feasible	Very Feasible

To find out the practicality of the product, the Engklek traditional gamesmedia integrated with QR-Code was tested on a small scale in a science learning material on photosynthesis. Here are some photos of use by students.



Figure 5. Use of integrated QR-Code Educational Game Media Engklek By Students

After trying the game, teachers and students were asked to fill out a questionnaire about the Engklek traditional games media integrated with QR-Code. The following is a summary table of the results of the practicality test.

Table 3. Practicality Test Result Recap

No	Location	Average teacher and student assessment	Category
1	SDN 12	99,2	Very Practical
2	SDN 51	92,9	Very Practical
3	SDN 28	99,2	Very Practical



## DISCUSSION

### Needs Analysis, Product Design and Development

First, an overview of the need for developing science learning media in elementary schools. The results of identifying problems related to science learning in the three schools where the research was conducted showed that the use of science learning media still needs to be improved. The results of observations and interviews concluded that science learning is still dominated by teachers' explanations that only focus on the contents of textbooks, and the use of technology-based teaching media has not been maximized. There is less facilitation of student activities and involvement in learning. The results of the needs analysis questionnaire showed that students in the three schools where the research was conducted were happy if teachers used media in learning, especially in science learning; students were also more enthusiastic about learning when the media used was game-based with a group learning system. Providing various learning experiences to students through learning media in science learning can produce an effective learning process and optimal learning outcomes (Linn & Eylon, 2011). The use of media in learning will make learning more effective because it makes students more motivated to learn, increases their understanding of the material, and makes the material more interesting (Arief, 2021). The results of interviews with teachers also showed that in the three elementary schools where the study was conducted, students' accessibility to the internet and gadgets was relatively high. They are accustomed to using smartphones to access social media content and play games. Thus, technology-based media in science learning can be used in the three schools.

Based on the results of interviews with teachers at the three schools where the study was conducted, it was shown that in learning science photosynthesis material, the media that is often used is slide media, where students will listen to the material presented by the teacher through the help of projector media. Even though media have assisted it, the learning process has not fully involved the activeness of students. Therefore, in science learning, it is necessary to facilitate students so that they can experience the learning process themselves. In the science learning process, the main emphasis is on providing direct experience that aims to develop skills in studying and understanding natural media scientifically (Olson & Loucks-Horsley, 2000; Pertiwi, Dyah Lingga, 2023; Tala & Vesterinen, 2015).

Through a series of design and development processes described in the results section, this study has produced an Engklek traditional game media integrated with QR-Code for science learning in elementary schools, especially on photosynthesis material. The characteristics of the Engklek traditional game media integrated with QR-Code developed in this study are presenting material through a QR-Code card display with various presentation forms (Pertiwi, Dyah Lingga, 2023). In addition to the material card, evaluative question cards are also presented in the quiz display. The Engklek traditional game media integrated with QR-Code facilitates various learning activities for students, from playing Engklek games to exploring technology-based learning resources using *QR-Code* cards.

The Engklek traditional games media that has been developed has the potential to bring significant changes to the science learning process in elementary schools. The monotonous science learning process with minimal meaningful learning activities for students will change with the use of Engklek traditional media integrated with QR-Code in learning. The changes in question include students being able to more easily understand the material being taught through the presentation of teaching materials through animated videos, reading charts, and reading tables with QR-code card displays. The use of this Engklek traditional media will create





an atmosphere of learning while playing, where students will play Engklek while learning photosynthesis material by utilizing technology in the form of QR-Code cards. These activities will increase student involvement in the learning process, which will affect students' understanding and science learning outcomes. Learning media that utilize technology and communication can function as attractive and effective learning tools to encourage improved student learning outcomes (Lin et al., 2017; Lova, 2022; Sudarsana et al., 2020).

### **Product Validity and Practicality Test**

Based on the results that have been carried out and the validation by material experts and media experts, the Engklek traditional games media product integrated with QR-Code is declared very feasible. In addition, the practicality test data by teachers and students as users show the Very Practical category. Thus, the product of this development research is feasible and practical for use in science learning in elementary schools on photosynthesis material. Integration of technology into traditional games, like Engklek, is essential because it can enrich children's learning experiences, preserve cultural heritage, and increase their motivation to learn (Rustan & Munawir, 2020). By utilizing learning strategy, technology and traditional games can become more interactive, interesting, and relevant to the digital world they are involved in (Rahmat et al., 2023; Wijayanti, 2016).

Engklek is one of the traditional games that is still popular today. In addition to the stages and rules of the game being easy to play, the playing process has challenges and excitement for children (Supriyono, 2018; Yulita, 2017). After integrating the learning card game about photosynthesis, children not only play Engklek but also learn. With the QR-Code on the playing cards and the Engklek playing board, students can explore photosynthesis further through various learning resources, such as reading texts, animated videos, reading tables, graphics, and so on. In this case, the QR-Code functions as a bridge between the physical world and the digital world, and by scanning the code, users can directly access online information such as website links, videos, application downloads, and others (Hirsch et al., 2020; Oh-Young, 2022). The playing and learning process carried out as a team also encourages students to collaborate. Collaboration is needed not only to win the Engklek game but also to complete various tasks and quizzes. In other words, students collaborate to learn together about photosynthesis material through the Engklek game.

### **CONCLUSION**

Based on a series of stages of the development process, testing and feasibility assessment that have been described previously, it can be concluded that teachers and students need learning media that can support the science learning process that can increase student involvement in the learning process. This need is answered through the development of Engklek traditional games media equipped with QR-Code which goes through a series of stages of ADDIE model development. The validity of the Engklek traditional games media is in the criteria of very feasible and very practical to use in science learning based on the assessment of material experts, media experts and practitioners of teacher and student responses as users.

The limitation of this study is that the media developed only covers a small part of the science teaching materials taught in elementary schools. In addition, the trial of the media was still on a small scale in three schools and its influence on the process and results of science learning on a large scale in elementary schools has not been studied. Therefore, although the media developed is already in the category of very valid and very practical for science learning



in elementary schools, further research is needed, for example in the creation of teaching media and wider trials. Further researchers can also continue effective research using other methods with a quantitative approach in the form of correlation and experiments or qualitative research so that research on the development of science learning media based on QR-Code integrated games can complement the literature comprehensively.

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