DEVELOPMENT OF INTERACTIVE E-BOOK BASED ON RADEC MODEL USING THE HEYZINE FLIPBOOK APPLICATION IN PHOTOSYNTHESIS MATERIALS FOR GRADE FOUR STATE ELEMENTARY SCHOOL OF TAMBAKSARI

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Abstract: 21st century education focuses on learning to take advantage of technology through the use of teaching materials. The aim of this study was to develop an interactive e-book teaching material using the RADEC model base with the heyzine flipbook application on photosynthesis material for fourth grade students. Analysis, design, development, implementation, and evaluation (ADDIE) is used as the research model. Form of a validation questionnaire is used as the main instrument of data collection to provide an assessment of the feasibility of the product as well as a response questionnaire from students and teachers to provide an assessment of the practicality of the product. The results carried out by the material, media and language expert validators show that interactive e-book teaching materials based on the RADEC model with the heyzine flipbook application on photosynthesis material are valid and appropriate for use by grade four students. Based on the responses of teachers and students, the interactive e-book was considered very good and very interesting for learning about photosynthesis.

Keywords: teaching materials, interactive e-books, RADEC model, elementary school students

INTRODUCTION

The educational paradigm in the 21st century emphasizes learning in critical skills, mastery of information technology, communication, and collaboration (Muhali, 2019:103). Based on a statement submitted in Permendikbud (Ministry Regulation) No 22 of 2016 as a principle of successful and efficient learning is the use of ICT (Afriyanti et al., 2018: 608). Therefore, modern education requires optimal use of technology. As explained by Akbar, (2021: 188), 21st century school standards, or also known as the "digital century", demand that digital technology be integrated into all activities and aspects of life.

The use of technology in teaching and learning activities can be optimized through the use of teaching materials as conveyed by Vivi Fitriyani, (2020: 515) that technological advances provide opportunities to develop digital-based learning materials and resources. To assist the learning process, you must use explanatory teaching materials in line with Magdalena et al., (2020: 312) because they are arranged methodically according to the curriculum to support learning, teaching materials as a main component need attention in the educational process. In contrast to conventional teaching materials which consist of textbooks, teaching materials using a technology base can obtain a more up-to-date teaching resource result. (Mardhiyah et al., 2021:33).

However, the demands of digitalization in 21st century education have not been fully implemented by schools. Based on the findings of the literature, it shows that the teaching materials used have a number of drawbacks such as text-oriented, books that are too heavy and thick (Lestari & Yulindrasari, 2021), and easily damaged because they are print-based so that they have not utilized learning resources using technology (Asrowi et al., 2019: 710). Even though Magdalena et al., (2020: 208) states that the development of teaching materials is highly recommended for every school and teacher because teachers must be able to keep up with increasingly modern student developments.

Natural and Social Sciences (IPAS) as a form of subject taught in elementary schools is usually only conveyed through lecture methods and printed books, even though learning in IPAS does not only emphasize knowledge but also a learning process that can make people curious, participate actively. active, and understand themselves and their environment (Budiawati & Budiarti, 2021:525). Therefore, subjects that require learning resources to facilitate this success are natural sciences. (Agustina et al., 2022: 3).

Interactive e-books are examples of educational learning resources that are integrated with technology and in line with 21st century educational standards. Arni Yunita and Hamdi., (2019:173) explained that this interactive e-book learning resource is ideal for 21st century education, which emphasizes learning to change according to the times. Compared to printed teaching materials, the use of technology-based learning resources has an important role in learning because interactive e-books present symbols, signs and shapes that can train students' skills (Harjono et al., 2020: 41). In addition, Saragih et al., (2021: 2645) explained that technology-based teaching materials can make students more attractive in undergoing learning.

The model introduced by Sopandi et al in 2019 is the RADEC model. The steps of this model are as the name implies: read, respond, discuss, explain, and create. The RADEC model has the advantage of an easy-to-understand syntax. In accordance with the objectives of learning science, many studies have proven that the RADEC model can increase student involvement in learning and has a beneficial impact on student learning outcomes (Sopandi et al., 2019:23; Yulianti et al., 2022:53; Sukmawati et al., 2020 :1737).

Based on these problems, the researcher created an interactive e-book using the RADEC model syntax for fourth grade students. By using the heyzine flipbook, interactive e-book teaching materials based on the RADEC concept are produced. This application has a hyperlink feature and can insert images, video and audio so that the display becomes interactive (Setianingrum et al., 2022: 836).

In the research conducted, a formulation of the problem was obtained in the form of these questions namely: (1) How is the development of interactive e-book teaching materials using the RADEC model base for grade four on photosynthesis material?; (2) How feasible are interactive e-book teaching materials using the RADEC model base for photosynthesis material for class IV IPAS?; and (3) How do teachers and students respond to interactive e-book teaching materials based on the RADEC model using heyzine flipbooks??

The research objectives were to find out: (1) the process of developing an interactive e-book based on the RADEC model with the heyzine flipbook application on class IV photosynthesis material; (2) the results of the feasibility study of the teaching

materials; and (3) the results of student and teacher reactions to the interactive e-books created.

RESEARCH METHODOLOGY

The research was carried out using a methodology in the form of Research and Development (R&D). While the ADDIE model is the development research methodology used. According to Branch, (2009:3) the ADDIE model consists of five phases for product development. The five development phases include: analyzing, designing, developing, implementing and evaluating. The product will be produced in the form of an interactive e-book using the RADEC model base for the application of Heyzine Flipbook in grade four on science subject. In the research conducted, the necessary data were collected using the research instrument, namely by using a student and teacher response questionnaire as well as expert validation sheets.

To ensure the feasibility or validity of the teaching materials produced, an expert validation analysis was carried out with the composition of media experts, linguists, and material experts. According to Sugiyono, (2019: 147) the Likert scale has five answer choices as follows:

1) Very Good = 5
2) Good = 4
3) Fair = 3
4) Poor = 2
5) Very Poor = 1

According to Riduwan, (2011: 102) the results of validation of the questionnaire can be determined using the following formula after the questionnaire is scored using a Likert scale:

$$\underline{x} = \frac{\sum x_i}{n}$$

Explanation:

$\underline{x}$: Average number

$\sum x_i$: Sum of various data

n : Total data

The Guttman scale is used in the student response questionnaire. This scale is suitable for elementary school students because it asks "Yes and No" questions. According to

Sugiyono, (2019:149-150) the answer scores range from 0 to 1, with 1 being the largest score. Sudjono in (Maulidta & Sukartiningsih (2018: 684), the final results of the student response questionnaire can be calculated using the formula or equation below:

$$P = \frac{f}{N} x100\%$$

Information:

Q : Percentage of responses from students

f : The number of scores resulting from data collection

N : Highest score

The following criteria are applied to the percentage of student responses to the questionnaire according to Riduwan, (2011: 41) :

Table 2

Student Assessment Criteria

Percentage	Criteria
0 – 20	Not Interesting
21 – 40	Less Interesting
41 – 60	Quite Interesting
61 – 80	Interesting
81 - 100	Very Interesting

The Likert scale, as the number 1 being the lowest value and 5 being the highest value, is used in determining the method of calculation in a teacher response questionnaire. The resulting questionnaire is then processed using the formula used to calculate student responses.

RESULT AND DISCUSSION

Products in the form of interactive e-book teaching materials using the RADEC model base using the heyzine flipbook application for grade four on photosynthesis material have been developed using the ADDIE model. Explanation of development results are as follows:

1. Analysis

Researchers conducted an analysis of the needs and potential of a problem faced by fourth grade students at State Elementary School of Tambaksari. The problem is that teachers almost never incorporate digital technology into the classroom. In addition, they used a student worksheet (LKS) and a printed textbook provided by the school. The result of the interviews show that teaching materials must be made that involve being active and motivating students.

2. Design

The researcher decided that a product needs to be developed in the form of an interactive e-book teaching resource based on the RADEC model with the Heyzine flipbook application after considering the findings of the analysis. Next, the researcher created a product framework to be developed by choosing an attractive image design, choosing the type of writing suitable for elementary school-age children, such as nunito sans bold, nunito sans regular and determining the color of interactive e-books. The conceptual design of the content of the interactive e-book product consists of a cover image, preface, list of materials, usage guide, learning outcomes, content, cover, bibliography, and developer profile. The application used for designing uses Canva and Heyzine Flipbook to make the book more interactive because it contains YouTube links, sound recordings, live worksheets, and games.

3. Development

The framework generated during the design stage is used to develop an interactive e-book teaching material at this stage. The following is the result of the development of an interactive e-book based on the RADEC model:

Figure 1.1 Design of Interactive E-Book Learning Material

Link for e-book: https://heyzine.com/flip-book/f69ed0863b.html

Then, material experts, media experts, and linguists assess interactive e-book teaching materials to provide an assessment of the product so that it can be declared feasible before being tested. The following results from the validation of interactive e-book teaching materials are presented in Table 3.

Table 3.
The results of the material expert validator's assessment

Indicator	Score
Suitability	25
Accuracy	10
Up-to-Date-ness	`10
Curiousity Stimulating	4
Average	**4,9**
Percentage	**98%**
Criteria	**Very Valid**

Based on Table 3. interactive e-book teaching materials using the RADEC model base are so valid to apply by revising or improving the material expert validator.
The results of the linguist validation assessment can be shown in Table 4.

Table 4.
The Result of Linguist Validator's Assessment

Indicator	Score
Clarity	8
Informativeness	5
Dialogically Interactive	`4
Based on student's development	5
Grammar Accuracy	16
Punctuation	4
Average	**4,2**
Percentage	**84%**

Criteria	**Very Valid**

Based on Table 4. A conclusion was obtained regarding interactive e-book teaching materials based on the RADEC model which is very valid for use in writing punctuation marks.

In a media expert validation assessment generated by can be shown in Table 5.

Table 5.
The result of the media expert validator's assessment

Indicator	**Score**
Size of e-book	10
Cover of e-book	4
Typograph	`7
Design of e-book	17
Illustration	5
Average	**4,3**
Percentage	**86%**
Criteria	**Very Valid**

Based on Table 5. it can be said that the interactive e-book based on the RADEC model is very valid to use by making improvements from the media expert validator.

4. Implementation

As many as 30 grade 4 SD Negeri Tambaksari tested interactive e-book teaching materials at the implementation stage. In the process of carrying out a learning carried out with the RADEC model with preliminary activities, the core of learning and closing. The following are the stages of implementing interactive e-book teaching materials based on the RADEC model in learning:

Read

In the intended stage students read a photosynthesis material already in the e-book

Answer

At the answer stage, students answer quizzes which are presented in the form of wordwall-based games

Discuss

At this stage students carry out discussions with a group of friends, and express their thoughts on the live worksheet.

Explain

In the fourth stage, students present the results of the discussion at the previous stage in front of the class

Create

In the final stage, students create a work in the form of a diorama of photosynthesis

5. Evaluation

In the ADDIE model evaluation is the final stage. The activity carried out is to conduct an assessment of learning activities. Learning with interactive e-book teaching materials makes students interested and able to follow the learning well. The good response of students in the use of interactive e-book teaching materials is supported and proven by the assessment of the questionnaire. The following are the results of a student response questionnaire related to teaching interactive e-books based on the RADEC model:

Table. The Result of Student's Response

Indicator	Percentage
Difficulty Level	100%
Interest	100%
Design Attractiveness	86%
Boring Material	100%
Cover Attractiveness	96%
Easy Language	96%
Interest on *games show quiz*	100%
Kemudahan quiz	96%
User Friendliness	93%

Ease of Access	83%
Criteria	**Very Interesting**

Based on Table 6. most students feel interested in learning using interactive e-book teaching materials, the language is easy for students to understand, the design is attractive and not boring, but some students respond that interactive e-book teaching materials are difficult to access. The percentage obtained was 92% so that it was included in the "Very Interesting" category. In addition, the teacher's response to the development of interactive e-books was stated quite well. This is evidenced by the assessment of the teacher's response questionnaire obtaining a score of 50 with an average number of 5 and a percentage of 100% so that based on the results of the assessment it is included in the "Very Good" category.

CONCLUSION

A conclusion was obtained regarding the analysis obtained from the research conducted by the researcher based on his findings:

1. In the process of developing interactive e-book teaching materials using the RADEC model base with the heyzine flipbook application on photosynthesis material carried out based on the ADDIE development model which is composed of the stages of analysis, planning, developing, implementing and evaluating the development went quite well and received a positive rating from educators and fourth grade students at Tambaksari Elementary School.
2. Analysis of the validation results of interactive e-book teaching materials based on the RADEC model with the application of heyzine flipbooks on photosynthesis materials obtained expert validation results obtaining a score of 98%, from linguists with a total of 84%, and 86% from media experts. The three validation scores indicate "Very Eligible or Very Valid" teaching materials.
3. Interactive e-book teaching materials based on the RADEC model with the heyzine flipbook application on photosynthesis material get a score from the teacher's response with a total of 100% entering the "Very Good" category and the results of the

student response questionnaire which totals 92% fall into the "Very Interesting" category".

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