

Radec Learning Model With E-Modul: An Effort to Enhance Student Critical Thinking Skills

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Abstract: The results of several studies show that the critical thinking skills of elementary school students in Indonesia are still relatively low. Therefore, this research aims to train elementary school students' critical thinking skills. This research is pre-experimental research using One Group Pretest-Posttest Design. The research instrument used was a pre-test and post-test critical thinking skills test, which was processed using the N-Gain formula to measure the influence of the RADEC learning model on students' critical thinking skills before and after learning activities. The results of the research show that, in terms of critical thinking indicators, the aspects of simple explanation, development of basic skills, concluding, strategy, and tactics have an N-Gain score in the high category, which shows that students' critical thinking skills increase in the high category with an N-Gain score of 0.8. Meanwhile, for further explanation, it has a value of 0.6 N-Gain in the medium category, which shows that students' critical thinking skills have increased in the medium category. It can be concluded that the simple explanation aspect is lower than other aspects of students' critical thinking skills. This shows that students experience a high and moderate increase in critical thinking skills after implementing RADEC-based learning and completing the pre-test and post-test so the application of the RADEC-based E-Module is very good for training or improving students' critical thinking skills. Critical thinking skills. The E-Module application being developed still needs to be improved in the form of a more attractive presentation and can add more detailed explanations such as commands, tasks, etc.

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INTRODUCTION

Based on several studies, it has been shown that the critical thinking skills of elementary school students in Indonesia are still relatively low. This is a significant problem that needs to be addressed immediately. For example, a study by Budiana (in Wijayanti et al., 2015) found that the percentage of scores for each aspect of critical thinking skills was less than 40%. This can happen because many results show that Indonesia is ranked at the bottom in terms of critical thinking skills. Indonesia still has the opportunity to improve and enhance critical thinking skills because it has potential and capacity resources that have not been developed (Davidi et al., 2021).

Critical thinking skills will have an impact on the cognitive development and adaptation of students (Syafi'i et al., 2021) (Lestari et al., 2021). This critical thinking skill is one of the indicators of 21st-century learning. According to Ennis (1995), critical thinking is part of a systematic, analytical, argumentative, holistic process of interpretation and is then concluded with an idea or assumption. If critical thinking skills have developed in students, students will be accustomed to making the right conclusions and solving problems and will be able to take rational steps that are supported by facts (Handayani, 2020) (Kurniawan et al., 2018).

The learning model and materials used by educators are still not in accordance with the needs or characteristics of each student, which is what causes Indonesia's low critical thinking skills (Lestari & Mukhlis, 2021). The learning model plays an important role in training students' cognitive development

and critical thinking skills. According to Haryanti & Febriyanto (2017), by implementing the right learning model and learning materials, it can certainly improve students' critical thinking skills. The emergence of a sense of joy, joy, and happiness in the learning process will further encourage students to produce maximum learning (Syaparuddin et al., 2020) (Mesra, 2023).

Based on the results of observations that were used as the research location, the same problems were identified. This can be found in one of the classes and lessons on plant body parts. These problems include the use of conventional models, teaching materials, and learning materials. The use of open models and materials are limited without the support of interactive multimedia components such as audio, images and video. Apart from that, the teaching materials in the form of modules used do not present the material entirely (Indriani et al., 2018). This is evidenced by the low student learning outcomes when researchers conducted a pre-research survey. This development of electronic modules is very important as an alternative teaching material that has not been applied in this school. In addition, the use of technology in schools has not been fully realized.

One solution is the implementation of the use of e-modules based on the RADEC model (Read, Answer, Discuss, Explain, Create) in the form of a digital application. Based on the review of previous research conducted by Yulianti et al. (2022), there are deficiencies in supporting teaching material elements to support the success of student critical thinking skills learning outcomes. The implementation of the RADEC learning model alone is not enough to determine learning outcomes, the need for the development of teaching materials to support the learning model used (Sukardi et al., 2022). In addition, in another study conducted by Erawati et al. (2020), the material developed is still limited, in this case, the development of complex, interesting, and certainly not boring teaching materials is needed. Furthermore, the review of the results of the Turnip et al. (2021) study needs a stand-alone media output, which of course makes it easier for students to use it.

The research uses an innovative and novel E-Module application developed by the researcher. This innovation and novelty can be seen from the development process to the maximum output produced, for example, it can be seen from the packaging of interactive teaching materials with complete multimedia components and the application developed is quite easy or user-friendly. Because according to Nadzir (2023), that electronic modules will give an interesting impression, this can be seen from the complex composition of the module design filled with multimedia components, such as animations, videos, audio, or an interesting question assessment system. With these components, the learning activity becomes more meaningful. Therefore, from the background, the researcher was interested in conducting research with the title "RADEC Learning Model With E-Modul: An Effort to Enhance Student Critical Thinking Skills" to produce teaching materials and materials that have validity and stimulate ease in its use in learning and are expected to affect students' critical thinking skills.

Based on the above exposition, this research has the following research problems.

- a. What are the pre-test and post-test results of students' critical thinking skills?
- b. What are the results of the user response of teachers and students?
- c. What are the results of the observation of the implementation of the RADEC model?

METHOD

This study used a pre-experimental method with a One Group Pretest-Posttest Design (Fraenkel, Wallen, & Hyun, 2012). This research design is suitable for this study because it only compares one group without a comparison group. This research design consists of critical thinking skill questions in the form of a pre-test before treatment and critical thinking skill questions in the form of a post-test after treatment.

Instrument

The research instrument consists of pre-test and post-test skill questions related to Robert Ennis's (1995) critical thinking indicators. The initial or pre-test is presented to students in a multiple-choice format. After completing the pre-test, students receive treatment in the form of learning using the RADEC model-based E-Module application, which has been validated by content experts, media experts, language experts, and learning experts. The content expert validation results, after reliability testing, yielded a Cronbach's alpha of 0.800, indicating 'Very Reliable.' The content validity, with an average V

index of 0.9 for a total of 5 questions, and for the presentation aspect, an average V index of 0.888889 for a total of 3 questions. The media expert validation resulted in a Cronbach's alpha of 0.711, indicating 'Reliable.' For content validity, in terms of technical quality, the average V index was 0.75 for a total of 5 questions. As for the visual communication aspect, the average V index was 0.66667 for a total of 7 questions.

Furthermore, a Cronbach's alpha of 0.762 was obtained for the language expert validation results, indicating 'Reliable.' As for the content validity, in terms of language suitability, the average V index was 0.8125 for a total of 8 questions. The learning expert validation results yielded a Cronbach's alpha of 0.875, indicating 'Very Reliable.' For content validity, regarding the teaching module aspect, the average V index was 0.95833 for a total of 4 questions. As for the worksheet (LKPD) aspect, the average V index was 0.98148 for a total of 9 questions. After completing the learning process, students were given a post-test.

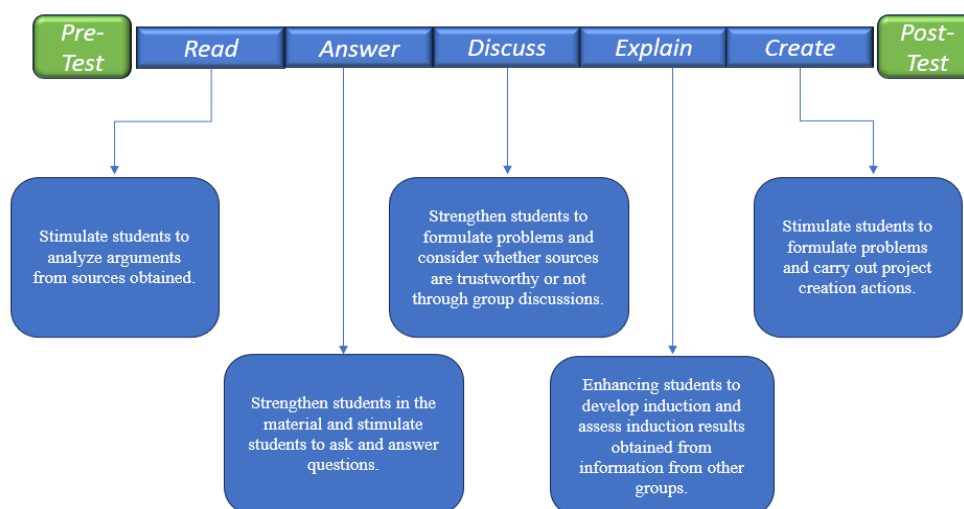


Figure 1. RADEC Framework for Stimulate Critical Thinking

Data Analysis

The data collection techniques employed in this research include tests, questionnaires, observations, and documentation. The data analysis technique utilizes the N-Gain formula to measure the improvement in critical thinking skills before and after the learning activities. The researcher also collected student and teacher response data to assess the E-Module application by determining the mode value. Furthermore, a Guttman scale is utilized for the data analysis technique applied to the RADEC model implementation sheet analysis.

Table 1. Data Analysis

No.	Purpose of Data Collection	Data Source	Data Analysis Technique
1.	Obtain student N-Gain pre-test and post-test results on each aspect of critical thinking skills.	Results of pre-test and post-test questions for Class IV students.	
2.	Get user response results.	Results of user response questionnaires from teachers and Class IV students.	Descriptive Statistics
3.	Obtain observation results of the implementation of the RADEC model.	RADEC model implementation sheet questionnaire results.	

RESULT AND DISCUSSION

The E-Module application is a teaching material developed by the researcher that contains material on plant body parts. The E-Module application will be tested to see the influence on students' critical thinking skills. The study was conducted for 3 sessions. Before implementation, the researcher conducted a validation test to test the feasibility of the E-Module application that had been developed. The first meeting was conducted by the researcher to explain how to use the E-Module application and conduct a pre-test for students. Then, in the second meeting, the learning process using the RADEC-based E-Module application was carried out. The RADEC model has 5 stages: read or read, answer or answer, discuss or discuss, explain or explain, create or create (Sukardi et al., 2021).

a. The Effect of the RADEC Model on Students' Critical Thinking Skills

In the first stage, namely reading, the students' activities are to read the material on plant body parts that is available in the E-Module application. Next, in the answer stage, students answer the pre-learning questions that are available in the E-Module application menu. In the discussion stage, students discuss the Student Activity Sheet (LKPD) that has been provided with their groups. After group discussion, in the explanation stage, students present the group discussion results. Next, in the last stage, namely creating, students work on the individual LKPD by making a collage work by utilizing plant body parts such as leaves or grains. The last meeting was carried out by conducting a post-test and providing a user response questionnaire and a RADEC model implementation sheet questionnaire to the observer. The results of the pre-test and post-test can be seen in Table 2 below.

Table 2. Result Pre-Test and Post-Test

Pre-Test Average	Post-Test Average	N-Gain Score	Criteria
38,7	88,2	0,80	High

Table 2 above shows that the critical thinking skills of grade IV students, with a total of 25 people on plant body parts material, have an average pre-test of 38.7. The average pre-test result is included in the 'Very Low' category, which shows that students' critical thinking skills are still low. After the implementation of learning, the post-test results of students were 88.2, with the category of 'Very Good'. This shows that after learning how to use the E-Module application, the post-test results of students show a good influence on its improvement. Furthermore, the N-Gain value for all students is 0.80, which is included in the 'High' criteria. Thus, from the data, it can be concluded that there is an increase in the critical thinking skills of grade IV students after being given learning using the RADEC-based E-Module Application.

Figure 1. Result of Pre-Test and Post-Test Critical Thinking Skills in each Aspect

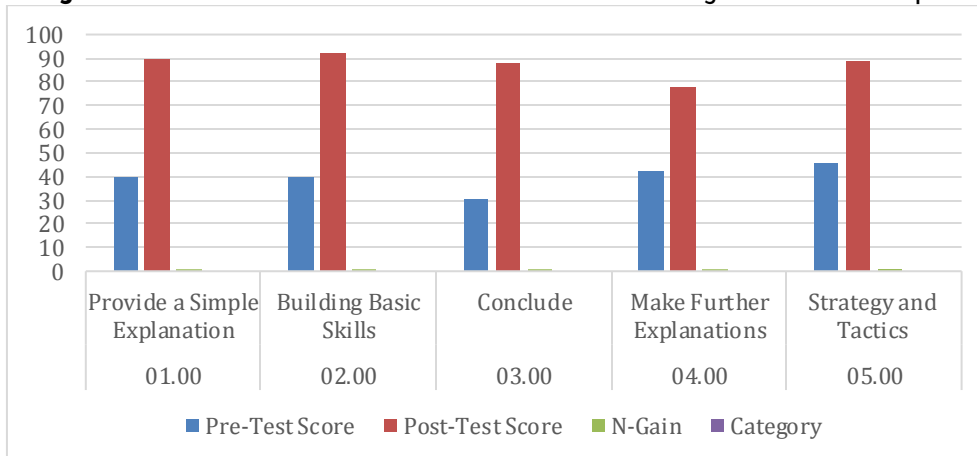


Figure 1, it explains that the increase in each aspect of students' critical thinking skills on the aspect of providing a simple explanation is 0.8 with the category of 'High.' The N-Gain value of students' critical thinking skills in the aspect of building basic skills is 0.8, with the category of 'High'. The N-Gain value of students' critical thinking skills in concluding is 0.8 with the category of 'High'. The N-Gain value of students' critical thinking skills in the aspect of providing a further explanation is 0.6, with the category of 'Medium'. The N-Gain value of students' critical thinking skills on the aspect of strategy and tactics is 0.9 with the category of 'High'. This shows that students experienced a high and medium increase in critical thinking skills after implementing RADEC-based learning and completing the pre-test and post-test.

b. Teacher and Student User Responses

Furthermore, the use of the E-Module application based on the RADEC model received user responses from students and teachers, as shown in Table 4.

Table 4. Result of Student Response Mode Results

Rated aspect	Mode	Category
Clarity and attractiveness of the material	4	Very Good
E-module convenience	4	Very Good
Attractive illustration design	4	Very Good
Usability of e-modules	4	Very Good

The results of Table 4, a summary of the mode of responses from grade IV students, show that the indicators of clarity and attractiveness of the material have a mode value of 4, which falls into the category of 'Very Good' because the presentation of the material is clear and interesting in its presentation. Furthermore, for the indicator of e-module ease, the mode value is 4, which falls into the category of 'Very Good' because students find it easy to understand the material on the E-Module application and easy to use the application. The indicator of attractiveness of design and illustrations has a mode value of 4, which falls into the 'Very Good' category because students are interested in the images and presentations on the E-Module application. Finally, the last indicator, the usefulness of the e-module, has a mode value of 4, which falls into the 'Very Good' category because students benefit from the E-Module application, motivate them, and add to their knowledge and insights.

Table 5. Result of Teacher Response Mode Results

Rated aspect	Modus	Category
Clarity and attractiveness of the material	4	Very Good
E-module convenience	4	Very Good
Attractive illustration design	4	Very Good
Usability of e-modules	4	Very Good

The results of Table 5, the recapitulation of the teacher's response mode, show that the clarity of the design indicator received a mode value of 4, which falls into the 'Very Good' category because the use of the E-Module application is easy and the application usage instructions are clear. Next, for the quality of design indicator, it received a mode value of 4, which falls into the 'Very Good' category because the E-Module application already contains various objects of images that are appropriate for the material. The use of font or size and type of font has also been well-chosen and appropriate. The module teaching component indicator received a mode value of 4, which falls into the 'Very Good' category because the accuracy of the material is in accordance with the learning outcomes, the learning outcomes path, and the learning objectives, as well as the order of the material presentation. The last indicator, namely the usefulness of the e-module, received a mode value of 4, which falls into the 'Very Good' category because the E-Module application is already based on the RADEC model and the application already trains the critical thinking skills of grade IV students.

c. Observation of the Implementation of the RADEC Model

The implementation of learning using the RADEC model was measured using the observation sheet for the implementation of the RADEC model. The learning implementation observation sheet was given to the observer, namely the teacher, before the learning process began. The results of the teacher's observation of the implementation of the RADEC model can be seen in the following table.

Table 6. Results of Teacher Observation of the Implementation of the RADEC Model

Rated aspect	Observation Result	Category
<i>Read</i>	100%	Very Good
<i>Answer</i>	100%	Very Good
<i>Discuss</i>	100%	Very Good
<i>Explain</i>	100%	Very Good
<i>Create</i>	100%	Very Good

Based on the results of the recapitulation of Table 6 show that the implementation of the RADEC learning model obtained a score of 100%, which falls into the 'Very Good' category. The observer explained that learning using the RADEC model has been implemented well, from reading, answering, discussing, explaining, and creating. Students were seen to be enthusiastic about participating in learning with the RADEC learning model, which they were experiencing for the first time. Other suggestions from the observer are to provide more detailed explanations, such as instructions, tasks, and others.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the RADEC-based e-module application is very good for training or improving students' critical thinking skills. The implementation of learning using the RADEC-based e-module application can attract students' interest and motivation to learn because of the interactive learning.

a. The Effect of the RADEC Model on Students' Critical Thinking Skills

The RADEC learning model has an effect on students' critical thinking skills, as evidenced by the research results, which show that after learning using the e-module application, the post-test results of students showed a good influence on their improvement.

b. User Response from Teachers and Students

In line with the research results, the user response is in the very good category, because students benefit from the e-module application, create motivation, and increase students' insights or knowledge.

c. Observation of the Implementation of the RADEC Model

Based on the research results, the implementation of the RADEC learning model obtained very good results from the observer because all 5 stages of the model have been implemented well by the researcher and can create enthusiasm and motivation from students during learning.

RECOMMENDATION

Recommendations for this research are (1) it is hoped that teachers can develop more creativity in packaging learning materials so that they can help improve students' critical thinking skills. (2) In carrying out the learning process, educators must be able to use innovative teaching materials with multimedia components so that the learning material is easily understood by students.

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