



Implementation of E-Module Integrated Science Based on *Joyful Learning* with Breathing System Theme on Students' Critical Thinking Skills and Learning Independency

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Article Info

Received 8 January 2021
Accepted 12 February 2021
Published 17 February 2021

Keywords:

E-module
joyful learning
critical thinking skills
learning independent

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Abstract

This research aims to determine the effect of e-module on students' critical thinking and learning independence development. The design of this research was quasi-experimental with a nonequivalent control group design. The sample was drawn using a random sampling technique with VIII D class as the experiment group and VIII C class as the control group. The data were collected through taking documentation data, tests, observation, and questionnaires. Using e-module was measured and analyzed by using t-test then descriptive analysis of observation and questionnaire. The research shows that t-test analysis to students' critical thinking skills is $10,77741 > 2,0003$, meaning that there is a significant difference because $t_{\text{value}} > t_{\text{table}}$. Meanwhile, for students' learning independency, it shows that $r=0,9319$ and the coefficient of determination of 86,84% mean that e-module has a positive effect on learning independency. Students also gave a good response of 83,87% so it can be concluded that e-module Integrated Science based on joyful learning was successfully affected' critical thinking skills and learning independency.

2021Universitas Negeri Semarang

INTRODUCTION

The rapid development of science and technology is a hallmark of the globalization era in the 21st century today. Such circumstances make it easy for each individual to access and obtain information (As'ari, 2014). National Education System Law No. 20 of 2003 clarifies that education must be student-centered so that students can be active in learning. Student center-oriented science learning in accordance with the 2013 Curriculum. Curriculum 2013 is the latest curriculum applied in Indonesia. Permendikbud No. 70 years 2013 on the basic framework and curriculum structure there are improvements to the Curriculum 2013, namely isolated learning patterns in which students can learn from anyone and at any time that can be obtained from the internet and passive learning patterns into critical learning. Through curriculum improvement in 2013, the government expects a change in the learning process. Students are expected to have important competencies that each individual must-have.

Critical thinking ability has an important role in the world of education. It is the main goal in learning because with adequate critical thinking ability, students can master the content of each subject they learn and apply it in their daily lives. Critical thinking ability is a skill that intensifies problem-solving for motor skills with learning process, learning procedures and learning performance (Rawahi, 2015). Nugraha et al. (2017) explained that critical thinking ability is a competency that every individual must have to live successfully and responsibly and face challenges in the present and future. But with the development of the world of education does not mean the Indonesian state science's ability to have a high score worldwide. This is evidenced by the 2018 PISA report results, which stated that Indonesia's IPA capability ranks 74th out of 79 countries (OECD, 2018). This shows that Indonesia's quality of education, especially in science, is far behind compared to other countries.

Jumaisyaroh et al. (2015) say that critical thinking ability is related to the independence of learning owned by a person. Students who have high critical thinking ability have better learning independence than students who have moderate or low learning independence (Yanwar & Fadila, 2019). Self-reliance on learning is defined as a learning process in achieving certain goals

required to be active individually or not dependent on others, including teachers (Isnaeni et al., 2018). Students' independence is to foster confidence that is very important for students and faster in receiving learning materials to shape the character of students for the better (Diniyah et al., 2018:15). One of the most important factors that students must have is self-reliance in learning. With the independence of learning, students can conduct their learning activities with a sense of responsibility, a strong will, and a high discipline attitude that will affect increased learning achievement.

The results of initial observations made in science learning activities at SMP Negeri 24 Semarang grade VIII showed that students' critical thinking ability is still low. Undeveloped critical thinking skills are caused in the learning process when given a question or problem, students have difficulty in solving problems, finding solutions and drawing conclusions. It is shown that UAS score data is only 20%-30% of students who have a score above KKM, with KKM science subjects for grade VIII being 75. Thinking learning strategies has not been used properly in the science learning process in schools, so students are less able to develop critical thinking skills and have little creative and innovative attitudes.

Low critical thinking ability is also followed by low self-reliance learning. This can be seen when students are not independent enough to study at home. Most students want to study if there will be a daily repeat or semester exam. Students lack the confidence to express their opinions. Many students are nice to play alone when the teacher describes the learning in the classroom. This is not following the indicators of self-reliance according to Aslamiyah et al. (2019) on indicators of non-reliance on others. Students must have confidence and pay attention in expressing opinions, as well as indicators of having a sense of responsibility.

One way to overcome critical thinking ability and learning independence is to provide teaching materials that students can use to learn. Erlinda (2017) stated that success in learning depends heavily on the use of learning resources or media used during the learning process. One of the right learning teaching materials is the module. Modules are used in the form of e-modules that utilize the field of science and technology. An electronic module is a form of presentation of self-taught materials systematically arranged to achieve a specific

learning objective. The research results conducted Rokhmania & Kustijono (2017) that the use of e-modules proved successful in improving critical thinking ability. Sugiharti et al. (2019) stated that e-module-assisted learning effectively improves students' critical thinking skills than conventional learning.

In this study, an e-module was uploaded on google classroom application. The google classroom use actually makes it easier for teachers to manage learning and deliver information quickly and accurately to students (Hardiyana, 2015). Malalina & Yeni (2018) argues that an educator can create a class with Google classroom, share assignments, submit suggestions, and view learning activities in one place quickly, easily and equipped with the best security technology at no additional cost. Google classrooms are accessible to teachers and don't take long. The advantages of the Google classroom application are easy to use, save time, flexible and free. Learning with the help of the Google classroom has the advantages to make it easier for students to learn. This google classroom app is accessible for free and specifically designed to help teachers or teachers learn.

One of the materials that can train students' critical thinking skills is understanding humans' respiratory systems. Human respiratory system material is a class VIII, even semester science material. The human respiratory system involves the internal organs to respiration. These internal organs cannot be seen directly, so the material is quite difficult because many terms and students must understand the respiratory process's organs.

E-modules are created by utilizing the development of science and technology-based joyful learning. Teaching materials contain materials equipped with interesting images delivered with joyful learning. Joyful learning is a learning model with an emphasis on learning while working that has fun characteristics, engages students and requires students to be active. Joyful learning uses a learning process at is applied to students through educational games, quizzes, group work, and other physical activities. Permatasari et al. (2014) said that the application of joyful learning is carried out in four stages, namely: experience, interaction, communication, and reflection. The indicators used in the research are according to Aqib (2013) which is experience, interaction, communication

and reflection which is a step in joyful learning activities in PAKEM.

Based on these problems, it is felt necessary to research "Implementation of E-Module Integrated Science Based on Joyful Learning with Breathing System Theme on Students Critical Thinking Skills and Learning Independency."

METHOD

This research uses an experimental method with an experimental quasi research design with a nonequivalent control group design (Sugiyono, 2017). The sampling technique is random sampling. Homogeneity test results obtained class taken as a sample of research in class VIII D (experimental class) and class VIII C (control class). The design pattern of the research design can be seen as follows:

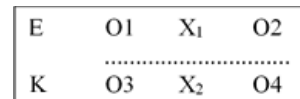


Figure 1. Nonequivalent Control Group Design Research Design

Description:

E: Experimental class

K: Control class

O1&O3 : Group of students before being treated

O2: Group of experimental class students after being treated with learning using joyful learning-based Integrated Science e-module

O4: Group of control class students after learning using science package book from school

Data collection techniques using tests, observations, and questionnaires. Test method to know critical thinking ability. Observation method to know the independence of students' learning during the learning. Questionnaire method to find out students' response to the use of integrated science e-module based on joyful learning. The analysis was homogeneity test, normality test, t test, and student response analysis.

RESULT AND DISCUSSION

Implementation of E-module Integrated Science based on Joyful Learning to Critical Thinking Ability

This study's influence aims to measure the differences in implementation or actions caused by the use of integrated science e-modules based on joyful learning to critical thinking ability.

Integrated science module e-module based on joyful learning affects if there are differences in critical thinking ability and independence of learning experiment class is greater than control class.

Test differences in the use of integrated science e-modules based on the respiratory system's joyful learning themes against critical thinking ability by conducting a difference test of the average post-test value of experimental classes and control classes. The results of the calculation show in Table 1.

Table 1. Test Differences in Average Critical Thinking Ability

Data	N	dk	t _{table}	t _{value}	Description
Experiment	31	60	2,0003	10,77741	H0 reject
Control					

Table 1 shows the value of $t_{value} > t_{table}$. The results show that H_a received a significant difference in the average value of students' critical thinking ability in the experiment class and control class. The existence of these differences indicates the influence of the use of integrated science e-module teaching materials based on joyful learning and critical thinking ability. The analysis results also showed significant differences in each indicator of students' critical thinking ability in the experiment class and control class, more in Figure 2.

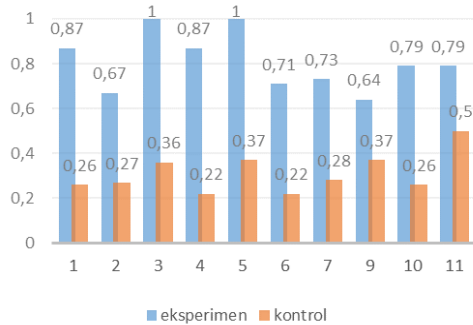


Figure 2. Percentage of Average Critical Thinking Ability Indicators

Description:

Indicator 1: focusing the question

Indicator 2: analyzing questions

Indicator 3: ask and answer a challenge or explanation

Indicator 4: consider the accuracy of the source

Indicator 5: observe and consider the observation report

Indicator 6: Induce and consider induction results

Indicator 7: deduct and consider deduction results

Indicator 9: identify the term

Indicator 10: identify assumptions

Indicator 11: decide on an action

Based on Table 1 of the average difference in the increase in the experiment class's critical thinking ability with the control class, there was a significant difference in the average value of students' critical thinking ability in the experiment class and control class. This is inseparable from the use of joyful learning-based Integrated Science e-modules that run smoothly, making students more active and enjoyable. In line with Khairiyah & Faizah (2020), which states that the advantages of learning that emphasizes the critical thinking process are that students will have the ability to solve problems both in the classroom and in the classroom and in dealing with real problems experienced. Soenarno (2017) revealed that the use of active and enjoyable learning can make students more enthusiastic in following the learning so that learning achievements increase. This is in line with research conducted by Prasetyowati et al. (2014). Learning using joyful learning-based science modules has a significant effect on learning outcomes and there is an increase in the average value of student learning outcomes.

There are differences in experimental classes' critical thinking ability using joyful learning-based Integrated Science modules on the theme of the respiratory system compared to control classes that use package books from schools. This is because the Integrated Science e-module based on the joyful learning theme of the respiratory system is able to help students to better understand the material than the package book from the school. Science package book from school does contain a lot of materials but often the material is considered incomplete, still need another companion book. The contents of help also make to understand better because there is too much writing. Science e-module based on its many themes, the story system is often material and at the needs of the material and more complete. It is compiled from several libraries and supporting info from various sources. According to Rosida and Tri (2017), the use of module teaching materials allows students to formulate problems, give arguments, and evaluate a given problem so that with the use of modules can train students' critical thinking skills. Learning using teaching materials improves optimal learning activities according to the level of ability and progress obtained during the learning process.

The results of this study are supported by the results of Minarni et al. (2019). The use of media

with visuals combining text and images can make place more interesting, fun and meaningful and can increase curiosity about what is learned. This can mean that visual media (color display or image) can facilitate understanding, strengthen memory, foster interest, and provide a relationship between the core of the subject matter and the real world. The use of interesting picture illustrations such as comics can also influence students' attractiveness to understand the material presented to achieve learning goals (Budiarti & Haryanti, 2016). The use of modules not only makes students rely on teachers as the only source of knowledge, but students can learn independently to solve existing tasks and problems. Thus, students' learning experience in discovering new knowledge helps them better understand the material they learn.

Besides, in its use modules in this research utilize the field of technology. Students can open modules with the help of a computer or smartphone. The learning process at the experience stage of students doing library studies opens and reads the Joyful Learning-based Integrated Science e-module in the Google classroom using a smartphone. The interaction stages are created when students have discussions and work in a group, and students are also invited to play roles. At this stage, it is seen how students interact with their respective groups. Interactions are made with a variety of discussion activities so that students do not get bored in receiving lessons. The communication stage is created when students deliver the results of the discussion in front of the class. Each group will come forward with a talking stick game where the teacher gives markers to the students, and then the markers will be distributed to all students accompanied by a song sung together. The markers will stop being distributed when the song is finished singing. The student who holds the marker when the song is finished is the first one. Then the group presents the results of the discussion first. The reflection stage is created when students work on the reflection questions at the end of each lesson. Furthermore, the teacher provides clarification or discussion together about the results of the discussion and, together with the students, draw conclusions from what has been learned at each meeting.

Ambarwati and Suyatna (2018), in their research, revealed that the application of electronic modules equipped with images and exercises of various questions can foster and improve students' critical thinking skills. In line with Sugianto et al. (2013) statement, electronic modules can be used as a source of independent learning that can help students improve their competence or cognitive understanding and not

rely on the only source of information. Learning with joyful learning or fun learning also has an effect. This learning uses a variety of methods such as discussion, practicum, and role-playing, where all methods are student-centered. Students are invited to build their knowledge and connect it with the concepts already in the e-module. Something new can be learned well depending on what is already known (advance organizers).

Widyawulandari and Indriayu (2019), in their research, revealed that active base learning or joyful learning activities by turning classes into centers of activities make the learning process more meaningful. Marlina (2020), joyful learning with teachers conveys learning while playing without neglecting the learning objectives making students more enthusiastic and active. Learning is more meaningful, and students can absorb the material taught better because students conduct their own search for information and learning activities to build knowledge.

Students' response to the use of joyful learning-based Integrated Science e-modules by 83.87% with highly effective categories became evidence of the influence of significant differences between experiment classes and control classes. The results of the highly effective student response questionnaire are in accordance with Herawati & Muhtadi (2018) research the use of teaching materials in the form of electronic modules increase attention to learning materials, make learning more persuasive, encourage student motivation and support in learning activities. In line with Khotim et al. (2015) the use of e-module-based makes learning more effective and efficient, and easier in the delivery of materials in learning activities. In addition, learning is also more effective and efficient. According to Rigos and Ayad (2010), pleasant conditions can increase students' motivation and desire to take lessons.

Most students state that learning using joyful learning-based Integrated Science e-module teaching materials makes students more active and interested in following learning because learning becomes more enjoyable. Students also feel more able to understand the learning materials so that students are motivated to learn more vigorously. In addition, research activities to solve problems in the Integrated Science e-module based on joyful learning can foster students' critical thinking skills. The implementation of joyful learning-based Integrated Science e-module uploaded on google classroom is a new thing for students so as to increase students' interest in implementing learning. This shows that learning with the help of teaching materials in the form of integrated

science modules based on joyful learning is effectively used and can be used as an alternative to be applied in learning.

Implementation of E-module Integrated Science based on Joyful Learning to Independent Learning

Analysis of learning independence is measured using observation sheets conducted by observers at each meeting. Observations were made during the learning process with three meetings. The integrated science e-modules is based on joyful learning themes of the respiratory system on student learning independence shown in Table 2.

Table 2. Results of e-module analysis on Learning Self-Reliance

Data Type	N	R	KD (%)	Dk	t_{table}	t_{value}	Description
Experiment	31	0,9319	86,84	12	2,1788	8,9	The are differences
Control	31						

Table 2 shows the value of $t_{value} > t_{table}$ so that H_0 is rejected and means there is an influence that is the difference in the use of Integrated Science e-module based on the joyful learning theme of the respiratory system self-reliance learning. In addition, based on observation data of 86.84% were influenced by the use of Integrated Science e-modules based on joyful learning themes of the respiratory system. In comparison, other factors influenced the remaining 13.16%. The results of self-reliance research on learning in experimental classes and control classes for each indicator during three meetings with 14 sub-indicators can be seen in the picture presented. Figure 3 shows the observations of students' learning independence on all six indicators.

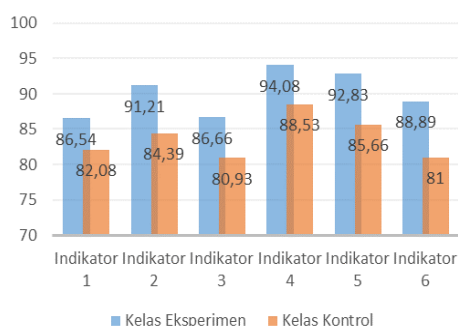


Figure 3. Results of Observation of Self-Reliance Learning

The study results are in line with Abidin and El Walida (2017), who explained that the use of e-modules could facilitate and help students in self-learning in this case, namely self-reliance on learning. In line with Rifa'i research (2019), which said that the use of e-modules could be a

trigger for self-reliance learning because they can learn with e-modules anywhere and anytime. In addition, Pradana et al. (2020) stated that learning using e-modules effectively improves student self-reliance and learning outcomes.

The observation sheet of self-reliance is carried out every meeting, from meeting 1 to meeting 3 and filled by 4 observers. Learning independence data is analyzed on every indicator. From the 6 indicators of self-reliance learning into 14 sub-indicators observed in the observation sheet of self-reliance learning. Analysis of the observation results of the six indicators of learning independence with 14 sub-indicators, among others as follows:

1. Indicators of Having Confidence

Indicators have confidence. There are three sub-indicators observed, namely sub-indicators of courage to express opinions, sub-indicators of courage to present the results of discussions or group work, and sub-indicators of attitudes when working on reflections or questions. The result of sub-indicator 1 analysis in the experimental class was 83.51% with excellent category and in the control class by 80.65% with good category. Observation sheet analysis in sub-indicator 2 in the experiment class was 84.95% with excellent category and in control class by 80.29% with good category. The result of observation sheet analysis in sub indicator 3 in the experiment class was 89.96% and in the control class was 85.30% with both having excellent categories. Based on these results, in the experiment class's indicators, there is a higher independence of learning than the control class and in the attitude items when working on reflection or questions have the highest difference between the experiment class and the control.

The learning process in the experimental class shows that students are very enthusiastic and active in learning. Learning is done using various methods such as discussion, practicum, and role-playing. All of these activities are student-centered, so students are required to play an active role in learning. Students also actively express their opinions both in the group and when presenting results in front of the class. Students are confident in presenting the results of discussions and even between groups competing with each other to finish working on the LKS in order to complete it in front of the class. The e-module arranged in various forms the usual multiple choices and square word, crossword puzzles, and matchmaking, making students interested in working and not getting bored quickly when working on each subsection. According to Sunismi and Fathoni (2017), the use of e-modules can increase student activities in

learning activities. In line with Bahri et al. (2018) research, active learning will increase motivation and competence in solving problems built by the knowledge that students have possessed.

2. Indicators Have a Sense of Responsibility

In the second indicators, two sub-indicators were observed, namely the 4th sub-indicator activeness of participating in group discussions/work and the 5th sub-indicator working on group tasks in the Integrated Science e-module based on joyful learning. The result of observation sheet analysis of item 4 in the experiment class was 92.47% and in the control class was 84.95% with both having excellent categories. The result of observation sheet analysis of the 5th item in the experiment class was 89.96% and in the control class was 83.87% with both having excellent categories. Based on these results, it is known that in the second indicator, having a sense of responsibility of the experiment class has higher learning independence than the control class.

This happens because the experimental class shows that students are very enthusiastic and active in learning using integrated science e-modules based on joyful learning. In addition, students are responsible and actively participate in group discussions. Students are also responsible for doing group tasks in working on LKS. Experimental classroom learning using joyful learning-based Integrated Science e-modules causes the independence of learning on indicators to have a higher sense of responsibility than control classes that use only package books from schools. Because in the use of joyful learning-based Integrated Science e-modules, students are tasked with opening through the Google classroom and understanding the materials taught at each meeting. Students are able to be responsible for opening integrated science modules based on joyful learning when learning is done. This shows that students in the experimental class have a sense of responsibility to open and understand the teaching materials used.

3. Indicators of non-hanging towards others

For indicators of indifference to others, there are 5 observed sub-indicators that are the 6th sub-indicator asking about the material in the Integrated Science e-module based on joyful learning that is not yet understood, the 7th sub-indicator answers the questions of teachers or friends in accordance with the material of the respiratory system, the 8th sub-indicator records important points about the respiratory system material described by the teacher, the 9th sub-indicator works on the material content in the Integrated IPA e-module based on joyful

learning, and the 10th sub-indicator uses other references to complement the information in the joyful learning-based Integrated Science e-module.

The average result of analysis in the 3rd sub-indicator stated that in the experiment class was 86.67% with a very good category and in the control class by 80.93% with a good category. Based on these results, it is known that the third indicator in the experimental class has higher learning independence than the control class, although it differs insignificantly. It shows that students in the experimental class are very enthusiastic in learning using integrated science e-module teaching materials based on joyful learning. Discussion activities are carried out in accordance with the contents of the e-module of the respiratory system material. Students confirm by asking the teacher about the material in the Joyful Learning-based Integrated Science e-module.

In addition, students also work on questions or exercises that exist in the Integrated Science e-module based on joyful learning individually that shows no depends on others (have their learning initiatives). In line with Hanikah's research (2019), self-help does not mean self-study without others' help, but with its initiatives with or without the help of others. In line with Danuri(2014:55) that teaching materials uploaded in the Google classroom is one that can improve learning initiatives. Learning in experimental classes many students ask questions and answer questions from teachers that cause more active learning. In addition, students independently record important points in the book as well as work on existing questions and use other references to get more information. These things can improve students' self-learning initiatives.

4. Indicators of Discipline

In the indicator of discipline behavior, there are 2 sub-indicators observed. First, the 11th sub-indicator of completeness in the Integrated Science e-module based on the respiratory system's joyful learning theme. Second, the 12th sub-indicator of completeness teaches lines in carrying out the task in the Integrated science e-module based on the joyful learning theme of the respiratory system. The 11th sub-indicator analysis in the experimental class was 93.19% and in the control class was 88.53%, with both having excellent categories. The 12th sub-indicator analysis in the experimental class was 94.98%, and in the control class was 88.53%, with both having excellent categories. In the indicators of the four experimental classes there is higher learning independence than the control class.

The difference in results is due to the experimental class's learning process showing that students are very enthusiastic and active in learning using integrated science modules based on joyful learning. In the experimental class, students are disciplined in opening e-modules contained in the Google classroom. Students also disciplined use e-modules contained in the Google classroom to learn independently. This led to the independence of learning on indicators of behaving in experimental classroom disciplines better than control classes.

The fifth indicator is one sub-indicator observed, the 13th sub-indicator of attitudes when following the learning process. The 13th sub-indicator analysis of the experimental class was 92.83%, and the control class was 85.66%, with both having excellent categories. Based on these results, it is known that in the fifth indicator of the experiment class, there is higher independence of learning than the control class.

A result of the class learning process experiments, students are very enthusiastic and active in using integrated science modules based on joyful learning. In addition, students can also control themselves from the attitude when following the learning process well and pay attention to what the teacher explains. According to Wiyoko et al. (2014), the use of electronic modules can increase student motivation and learning.

6. Indicators of Accuracy and Seriousness in Analyzing Teaching Materials

In the last indicator, thoroughness, and seriousness in analyzing teaching materials, one sub-indicator observed that the 14th sub-indicator reading and understanding the teaching material e-module Integrated Science based on joyful learning theme of the respiratory system. The 14th sub-indicator analysis results in the experimental class were 88.89% with excellent indicators and in the control class of 81% with good indicators. Based on these results, it can be found that in the sixth indicator, the accuracy and seriousness in analyzing the teaching materials of experimental classes have higher learning independence than the control class.

In the classroom learning experiments use e-modules uploaded on google classrooms that students can use to learn to understand the respiratory system material better because the material is more complete than the one in the science package book. It causes self-reliance to learn on indicators of thoroughness and seriousness in analyzing teaching materials. The experimental classes have better learning independence than the control classes.

The results of self-reliance analysis by Tahar & Enceng (2006) research can increase the independence of learning. With the e-module media uploaded through google classroom, students can know the learning objectives to be achieved. In addition to trying to prepare for learning activities, according to students with learning media uploaded through google classroom, learning activities become more interesting. The results are in accordance with the results of research stated by Verstegen et al. (2016), that google classroom supports the implementation of learning so as to improve students' ability to learn.

The study results are also in accordance with Sutisna (2016), which explains the use of media in the google classroom effectively in increasing the independence of learners learning the learning package C program.

CONCLUSION

Based on the results of research and data analysis conducted, it can be concluded that: 1) There are differences in the use of joyful learning-based Integrated Science e-modules to critical thinking ability indicated by the results of different t-tests. It shows a significant difference in the average value of students' critical thinking ability in experimental classes and control classes. 2) There are differences in the use of joyful learning-based Integrated Science e-modules for student learning independence indicated by different test results that showed a difference of $r = 0.9319$ and a coefficient of determination of 86.84%.

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