# Effectiveness of 5E Cycle Learning Model Assisted by Wordwall Media in Improving Critical Thinking Ability

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**Article Info**

**Article History**
Received: 2025-03-11
Revised: 2025-04-27
Published: 2025-05-10

**Keywords:**
*5E Learning Cycle; Wordwall; Critical Thinking; Learning Outcomes; Elementary School.*

**Abstract**

This research aims to test the effectiveness of the 5E Learning Cycle learning model assisted by Wordwall media on critical thinking skills and student learning outcomes on ecosystem material in grade V elementary school. The research method used was a pseudo-experiment with a pretest-posttest control group design. Normality and homogeneity tests showed that the data were normally distributed and homogeneous. The results of hypothesis testing using Paired Sample T-Test showed a significant difference between experimental and control classes on critical thinking skills (sig. = 0.000) and learning outcomes (sig. = 0.036). Furthermore, MANOVA analysis showed that the learning model simultaneously affected critical thinking skills and learning outcomes (sig. = 0.000). The Between-Subjects Effects test also confirmed the results that the treatment variable (the use of the 5E model with Wordwall) had a significant effect on variable Y1 (critical thinking) with Fhitung = 38.868 and on variable Y2 (learning outcomes) with Fhitung = 4.645. Thus, it can be concluded that the 5E Learning Cycle learning model assisted by Wordwall media effectively improves students' critical thinking skills and learning outcomes on ecosystem material in class V elementary school Neger 23 Ampalu Kota Padang.

**Artikel Info**

**Sejarah Artikel**
Diterima: 2025-03-11
Direvisi: 2025-04-27
Dipublikasi: 2025-05-10

**Kata kunci:**
*5E Learning Cycle; Wordwall; Berpikir Kritis; Hasil Belajar; Sekolah Dasar.*

**Abstrak**

Penelitian ini bertujuan untuk menguji efektivitas model pembelajaran 5E Learning Cycle yang dibantu media Wordwall terhadap kemampuan berpikir kritis dan hasil belajar siswa pada materi ekosistem di kelas V sekolah dasar. Metode penelitian yang digunakan adalah eksperimen semu dengan desain pretest-posttest control group. Uji normalitas dan homogenitas menunjukkan bahwa data berdistribusi normal dan homogen. Hasil uji hipotesis menggunakan Paired Sample T-Test menunjukkan adanya perbedaan signifikan antara kelas eksperimen dan kontrol pada kemampuan berpikir kritis (sig. = 0,000) dan hasil belajar (sig. = 0,036). Selanjutnya, analisis MANOVA menunjukkan bahwa model pembelajaran berpengaruh secara simultan terhadap kemampuan berpikir kritis dan hasil belajar (sig. = 0,000). Uji Between-Subjects Effects juga menguatkan hasil bahwa variabel perlakuan (penggunaan model 5E dengan Wordwall) memberikan pengaruh signifikan terhadap variabel Y1 (berpikir kritis) dengan Fhitung = 38,868 dan terhadap variabel Y2 (hasil belajar) dengan Fhitung = 4,645. Dengan demikian, dapat disimpulkan bahwa model pembelajaran 5E Learning Cycle yang dibantu dengan media Wordwall efektif meningkatkan kemampuan berpikir kritis dan hasil belajar siswa pada materi ekosistem di kelas V sekolah dasar Neger 23 Ampalu Kota Padang.

## I. INTRODUCTION

Education is one of the main pillars in the development of a nation. In Indonesia, basic education has a very important role in shaping students' character and abilities. Basic education not only serves as a foundation for academic knowledge, but also as a means to build moral, ethical and social values that will guide students throughout their lives.

Education aims to improve the quality of human resources through the development of competencies that include attitudes, knowledge, skills, and critical thinking (Canton, 2021). At the primary school level, education has a vital role in shaping students' basic skills and knowledge. The Indonesian government through Law No. 20/2003 on the National Education System (Sisdiknas) emphasizes that national education aims to educate the nation's life and develop the whole person, which includes aspects of intellectual, emotional, social, and spiritual intelligence (Indonesia, 2003).

One of the most important competencies to be developed in basic education is critical thinking skills. This ability not only helps students in solving everyday problems, but also prepares them to face more complex challenges in the future.

According to critical thinking skills involve analyzing, evaluating, and synthesizing information that can be used to make informed decisions. For example, when students are faced with environmental issues, their critical thinking skills will allow them to analyze information about the impact of pollution, evaluate possible solutions, and synthesize the information to make sustainable decisions (Aldi & Khairanis, 2024). Research shows that students who have good critical thinking skills tend to be more successful in learning and adapting in a changing environment (Karim, n.d.).

According to critical thinking is the ability to assess and analyze information rationally to make the right decision. In elementary school learning, this ability is needed to facilitate students in solving problems and making the right decisions based on available information. In the context of ecosystem learning, students are expected to be able to analyze various factors that affect the balance of the ecosystem and the impact of changes that occur in it. Therefore, the development of critical thinking skills is very relevant to improve students' understanding and learning outcomes in this material (Calma & Davies, 2025).

Learning outcomes are an important indicator in assessing the extent to which students successfully understand the material taught. In the context of the learning ecosystem, learning outcomes are not only measured by understanding basic concepts, but also by students' ability to apply that knowledge in real situations. Research by (Setyaningsih et al., 2019). Shows that the use of learning models that allow students to interact directly with the material through experiments and group discussions can improve student learning outcomes.

One approach that can be used to improve critical thinking skills and student learning outcomes is the 5E Learning Cycle model. Research by (Irwanto et al., 2022). Revealed that the application of the 5E Learning Cycle model in biology learning can improve students' critical thinking skills and learning outcomes. This model is designed to improve students' understanding of concepts through five stages, namely Engage, Explore, Explain, Elaborate, and Evaluate (Bybee et al., 2006). Each stage in this model has specific and interrelated objectives, so that students can be actively involved in the learning process. For example, in the Engage stage, the teacher can start with a question that triggers students' curiosity, such as “What happens if we don't take care of our environment?” This will attract students' attention and encourage them to learn. This will attract students' attention and encourage them to think deeper.

The theory of cognitive development proposed by (Piaget & Herborth, 1973). suggests that children's thinking abilities develop with age and experience. This theory emphasizes that learning that is carried out actively and involves various stages of understanding will support the development of students' critical thinking. Piaget suggested the importance of direct experience in influencing the way children think about the world. A learning model that allows students to be active in the learning process, one of which is the 5E Learning Cycle model, this learning model can accelerate the development of critical thinking and student learning outcomes (Aldi & Kawakib, 2025).

Previous research shows that the application of the 5E model can improve student learning outcomes in various fields, including science (Hofstein & Lunetta, 2004). However, the implementation of this model often faces challenges, especially in terms of using the right media to support the learning process.

The 5E Learning Cycle model is a systematically designed learning approach to improve the understanding of science concepts among students, especially at the elementary school level. This approach consists of five integrated stages: Engagement, Exploration, Explanation, Elaboration, and Evaluation. (Kalantarnia et al., 2020). this model focuses on the active involvement of students in the learning process, where they do not simply receive. information, but also participate in the discovery of knowledge through direct experience and social interaction. Research shows that the application of this model can significantly improve student learning outcomes in science subjects, especially when compared to conventional learning methods that are more passive.

The use of technology-based media in learning is proven to be effective in increasing student motivation and engagement. (Sanai et al., 2021). In his research revealed that the use of interactive media in learning can enrich students' learning experiences, increase their engagement, and help them understand more complex concepts in a more enjoyable way so as to improve student learning outcomes. This media strongly supports the stages in the 5E model, where students not only receive information but are also active in exploring and connecting new information with existing knowledge (Aldi & Barizi, 2025).

Wordwall is a digital platform that allows teachers to create various interactive activities that can increase student engagement (Sari & Yarza, 2021). For example, teachers can create interactive quizzes that test students' understanding of ecosystems by providing challenging questions, thus helping students to think critically. The use of interactive media can provide a more interesting and enjoyable learning experience for students. The use of interactive media such as Wordwall can provide a more interesting and enjoyable learning experience for students (Aldi et al., 2025).

Research shows that interactive media can increase student motivation and engagement in the learning process (Schwenk et al., 2017). By utilizing platforms such as Wordwall, teachers can create a more dynamic and interactive learning environment, so that students are more motivated to learn. Therefore, it is important to explore the effectiveness of the combination of the 5E Learning Cycle model and Wordwall media in improving students' critical thinking skills (Khairanis & Istiadah, 2025).

This research is also relevant to the current development of educational technology, where the use of digital media in learning is increasing. By utilizing platforms such as Wordwall, teachers can create a more interactive and enjoyable learning experience for students. This is in line with research showing that the use of technology in education can improve student motivation and learning outcomes (Chen et al., 2016).

With this background, this study aims to determine (1) How is the effectiveness of using the 5E Learning Cycle learning model assisted by Wordwall media on students' critical thinking skills on ecosystem material in grade V elementary school? (2) How is the effectiveness of using the 5E Learning Cycle learning model assisted by Wordwall media on student learning outcomes on ecosystem material in grade V elementary school? (3) How is the effectiveness of using the 5e learning Cycle learning model assisted by Wordall media on critical thinking skills and student learning outcomes on ecosystem material in grade V elementary school (Khairanis et al., 2025).

## II. METHOD

Quantitative research was used in this research method with a quasi-experimental design and pretest-postest control group design (Benítez-Chavira et al., 2023). The population in this study were all fifth grade students totaling 50 students, which were divided into parallel classes, namely class Va and class Vb, each class totaling 25 students. The research was conducted at SDN 23 Ampalu Padang City.

The population in this study were all fifth grade students at SDN 23 Ampalu Kota Padang, totaling 50 students, from two parallel classes, namely class Va and class V b, each of which had 25 students. The samples in this study were class Va students and class V b students, each of which amounted to 25 students. Thus, this research seeks to ensure that the results obtained are reliable and reflect the actual conditions in the field.

Data collection techniques are the most strategic step in research, because the purpose of this research is to get data (Sugiono, 2024).The data collection techniques used in this study are in the form of test and non-test techniques.

The data analysis technique in this study was carried out based on guidelines from Sugiyono, which explains that inferential statistics are used to analyze sample data and generalize the results to the population. In this study, the t-test was used as an analytical technique to test the significance of the difference between two variables, according to the procedures outlined by Sugiyono. All analyses were conducted with the help of SPSS to ensure accuracy and ease of data processing.

## III. RESULT AND DISCUSSION

1. The effectiveness of using the 5E Learning Cycle learning model assisted by Wordwall media on students' critical thinking skills on ecosystem material in class V elementary school
   a) Uji Normalitas

      Normality testing is used in experimental and control classes with each data obtained during pretest and posttest. The provisions of the normality test are if the significant gain obtained> 0.05 then the data will be normally distributed, but if the significant gain obtained <0.05 then the data is distributed abnormally. The results of the normality test can be seen in the following table.

**Table 1.** Normality Test Results of Critical Thinking Ability

| Kelas | | Sig | Kesimpulan |
|---|---|---|---|
| Eksperimen | Pretest | 0,155 | Normal |
| | Posttest | 0,132 | Normal |
| Kontrol | Pretest | 0,439 | Normal |
| | Posttest | 0,214 | Normal |

Based on table 1 above, it shows that the results of testing the normality of critical thinking skills and learning outcomes of experimental class students, the pretest results were found to be significant at 0.155 and the posttest results were found to be significant at 0.132. While the results of testing the normality of critical thinking skills and learning outcomes of control class students, the pretest results were significant at 0.439 and the posttest results were significant at 0.214. The significant acquisition of the experimental class pretest and posttest results> 0.05 and likewise with the significant acquisition of the control class pretest and posttest results> 0.05. Therefore, it can be concluded that the acquisition of data generated from both classes has been normalized.

b) Uji Homogenitas

Homogeneity testing is used in experimental and control classes with data obtained during pretest and posttest. The determination of homogeneity testing is if the significant gain obtained> 0.05 then the data will be homogeneously distributed, but if the significant gain obtained <0.05 then the data is not homogeneously distributed. The data results of homogeneity testing can be seen in the following table.

**Table 2.** Results of Homogeneity Test for Critical Thinking Ability

| Data | Sig | Kriteria |
|---|---|---|
| Pretest | 0,183 | Homogen |
| Posttest | 0,337 | Homogen |

Based on table 2 above, shows the results of testing the homogeneity of critical thinking skills and learning outcomes of students the results of the pretest obtained significant of 0.183 and the results of the posttest obtained significant of 0.337. Significant gains from pretest and posttest results show that > 0.05, therefore it can be concluded that the two classes have the same variance (homogeneous).

c) Uji Hipotesis

Hypothesis testing is used to see if there are differences in the critical thinking skills of students in experimental and control classes. The results of testing the hypothesis of this study can be seen in the following table.

**Table 3.** Paired Sample T-Test Results

| Independent Samples Test | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Hasil | Equal variances assumed | 0.939 | 0.337 | 6.234 | 48 | 0.000 | 16.400 | 2.631 | 11.111 | 21.689 |
| | Equal variances not assumed | | | 6.234 | 46.511 | 0.000 | 16.400 | 2.631 | 11.107 | 21.693 |

Based on table 3 above, shows the results of testing the hypothesis of the critical thinking ability of students after being treated, obtained T of 46.511 with a significant gain of 0.000. Where it shows that the significance of the posttest <0.05, it can be concluded that there is a difference between the two classes of critical thinking skills after being treated.

So in this study it can be concluded that there is a difference in critical thinking skills in the experimental and control classes after being treated (posttest) or H0 is rejected and Ha is accepted. So the Learning Cycle 5E model assisted by Wordwall media is effective on students' critical thinking skills in ecosystem material in grade V elementary school.

2. The effectiveness of using the 5E Learning Cycle learning model assisted by Wordwall media on student learning outcomes on ecosystem material in class V elementary school

a) Uji Normalitas

Normality testing is used in experimental and control classes with each data obtained during pretest and posttest. The provisions of the normality test are if the significant gain obtained> 0.05 then the data will be normally distributed, but if the significant gain obtained <0.05 then the data is distributed abnormally. The results of the normality test can be seen in the following table.

**Table 4.** Normality Test Results of Learning Outcomes

| Kelas | | Sig | Kesimpulan |
|---|---|---|---|
| Eksperimen | Pretest | 0,168 | Normal |
| | Posttest | 0,111 | Normal |
| Kontrol | Pretest | 0,192 | Normal |
| | Posttest | 0,157 | Normal |

Based on table 4 above, it shows that the results of testing the normality of critical thinking skills and learning outcomes of experimental class students, the pretest results were found to be significant at 0.168 and the posttest results were found to be significant at 0.111. While the results of testing the normality of critical thinking skills and learning outcomes of control class students, the pretest results were significant at 0.192 and the posttest results were significant at 0.157. The significant acquisition of the experimental class pretest and posttest results> 0.05 and likewise with the significant acquisition of the control class pretest and posttest results> 0.05. Therefore, it can be concluded that the acquisition of data generated from both classes is normal.

b) Uji Homogenitas

Homogeneity testing is used in experimental and control classes with data obtained during pretest and posttest. The determination of homogeneity testing is if the significant gain obtained> 0.05 then the data will be homogeneously distributed, but if the significant gain obtained <0.05 then the data is not homogeneously distributed. The data results of homogeneity testing can be seen in the following table.

**Table 5.** Homogeneity Test Results of Learning Outcomes

| Data | Sig | Kriteria |
|---|---|---|
| Pretest | 0,950 | Homogen |
| Posttest | 0,624 | Homogen |

Based on table 5 above, shows the results of testing the homogeneity of critical thinking skills and student learning outcomes, the results of the pretest obtained a significant of 0.950 and the results of the posttest obtained a significant of 0.624. Significant gains from pretest and posttest results show that > 0.05, therefore it can be concluded that the two classes have the same variance (homogeneous).

c) Uji Hipotesis

Hypothesis testing is used to see if there are differences in the critical thinking skills of students in experimental and control classes. The results of testing the hypothesis of this study can be seen in the following table.

**Table 6.** Paired Sample T-Test Results

| Independent Samples Test | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference Lower | Upper |
| Hasil | Equal variances assumed | 0.244 | 0.624 | 2.155 | 48 | 0.036 | 4.200 | 1.947 | 0.282 | 8.118 |
| | Equal variances not assumed | | | 2.155 | 47.853 | 0.036 | 4.200 | 1.949 | 0.281 | 8.119 |

Based on table 6 above, shows the results of testing the hypothesis of the critical thinking ability of students after being treated, obtained T of 2.155 with a significant gain of 0.036. Where it shows that the significance of the posttest <0.05, it can be concluded that there is a difference between the two classes of critical thinking skills after being treated.

So in this study it can be concluded that there is a difference in critical thinking skills in the experimental and control classes after being treated (posttest) or H0 is rejected and Ha is accepted. So the Learning Cycle 5E model assisted by Wordwall media is effective on student learning outcomes in ecosystem material in grade V elementary school.

3. The effectiveness of using the 5e learning cycle model assisted by Wordall media on critical thinking skills and student learning outcomes on ecosystem material in grade V elementary schools

a) Uji Normalitas

The normality test is used to see whether the sample under study is normal or not. In the normality test using the Kolmogrov-Smirnov test with the SPSS 26 program with sig. 5%. This test was carried out in classes Va and Vb on the posttest results. The provisions of the normality test are if the sig value> a so that the data is normally distributed, while if the sig value < a the data is not normal.

**Table 7.** Normality Test of Postest Classes Va and Vb

| Karakteristik uji Kolmogorv Smirnov | Berpikir Kritis | | Hasil Belajar | | Hasil | Interpretasi |
|---|---|---|---|---|---|---|
| | Va | Vb | Va | Vb | | |
| Sig. a (0,05) | 0,132 | 0,214 | 0,111 | 0,157 | Sig > a | Normal |

In table 7 is the result of the normality test between sig> a. so the results are normally distributed. Data on critical thinking variables in class Va get a sig value. > a then (0.132>0.05) then the Va class value is tested normal while in class Vb get a sig value. > a then (0.214>0.05) then the value of class Vb is tested normal. Data on learning outcomes in class Va get a sig value. > a then (0.111>0.05) then the value of class Va is tested normal while in class Vb get a sig value.

b) Covariance Variance Matrix Homogeneity Test

One of the requirements carried out before using the multivariate analysis test (MANOVA). In the covariance matrix homogeneity test, which is to see whether variable X has a significant effect on variables Y1 and Y2. The covariance matrix homogeneity test uses the following hypothesis.

**Table 8.** Covariance Variance Matrix Homogeneity Test

| Box's Test of Equality of Covariance Matrices[a] | |
|---|---|
| Box's M | 3,257 |
| F | 1,037 |
| df1 | 3 |
| df2 | 414720,000 |
| Sig. | ,375 |

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.
a. Design: Intercept + MODEL

Box's M value = 3.257 with sig. 0,375. In accordance with the decision criteria if the sig value> a so that H0 is accepted, because the sig value> a where a = 0.05 so it is concluded that H0 is accepted where the two Y variables have the same variance-covariance matrix for variable X.

c) Variant Homogeneity Test

In addition to the homogeneity test of the covariance variance matrix, it is continued with the variance homogeneity test, which is the second requirement that must be carried out before using the multivariant analysis test (MANOVA).

There is a difference between the homogeneity test of the Covariance Variance Matrix and the homogeneous variance test, namely the homogeneous test of the covariance variance matrix to see the variables Y1 and Y2 simultaneously affect variable X. While the homogeneity test of variance is to see the effect of variable Y1 on X and Y2. While the homogeneity test of variance is to see the effect of variable Y1 on X and variable Y2 affects variable X individually.

**Table 9.** Variant Homogeneity Test

| Levene's Test of Equality of Error Variances[a] | | | | | |
|---|---|---|---|---|---|
| | | Levene Statistic | df1 | df2 | Sig. |
| Berpikir Kritis | Based on Mean | ,939 | 1 | 48 | ,337 |
| | Based on Median | ,446 | 1 | 48 | ,507 |
| | Based on Median and with adjusted df | ,446 | 1 | 43,542 | ,508 |
| | Based on trimmed mean | ,766 | 1 | 48 | ,386 |
| Hasil Belajar | Based on Mean | ,244 | 1 | 48 | ,624 |
| | Based on Median | ,136 | 1 | 48 | ,714 |
| | Based on Median and with adjusted df | ,136 | 1 | 47,906 | ,714 |
| | Based on trimmed mean | ,264 | 1 | 48 | ,610 |

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a. Design: Intercept + MODEL

In table 9, a significant value is obtained which shows the variables of critical thinking and learning outcomes, namely: Critical thinking Sig value> a (0.337> 0.05) and learning outcomes sig value> a (0.624> 0.05), The above shows that the variables of critical thinking and learning outcomes individually are the same for the treatment variable. So that it can be continued with multivariate test analysis (MANOVA).

d) Multivariate Test

**Table 10.** Multivariate Test

| Multivariate Tests[a] | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Effect | Value | F | Hypothesis df | Error df | Sig. | Partial Eta Squared |
| Intercept | Pillai's Trace | ,994 | 3829,717[b] | 2,000 | 47,000 | ,000 | ,994 |
| | Wilks' Lambda | ,006 | 3829,717[b] | 2,000 | 47,000 | ,000 | ,994 |
| | Hotelling's Trace | 162,967 | 3829,717[b] | 2,000 | 47,000 | ,000 | ,994 |
| | Roy's Largest Root | 162,967 | 3829,717[b] | 2,000 | 47,000 | ,000 | ,994 |
| Model | Pillai's Trace | ,470 | 20,815[b] | 2,000 | 47,000 | ,000 | ,470 |
| | Wilks' Lambda | ,530 | 20,815[b] | 2,000 | 47,000 | ,000 | ,470 |
| | Hotelling's Trace | ,886 | 20,815[b] | 2,000 | 47,000 | ,000 | ,470 |
| | Roy's Largest Root | ,886 | 20,815[b] | 2,000 | 47,000 | ,000 | ,470 |

a. Design: Intercept + MODEL
b. Exact statistic

In table 10 multivariate test explains the comparison test with the average components of variables Y1 and Y2 simultaneously with the X component there is a Pillai's Trace, Wilks' Lambda, Hotelling's Trace, Roy's Largest Root statistical test.

Based on the results in table 10, the significant treatment indicated by the Pillai's Trace, Wilks' Lambda, Hotelling's Trace, Roy's Largest Root procedures obtained a figure of 0.000, where 0.000 is smaller than 0.05 so that a decision is given to reject Ho and accept H1, so together the X variables show differences in the two Y variables.

e) Covariance of Between Subjects Effects

**Tabel 11.** Test of Between Subjects Effects

| Tests of Between-Subjects Effects | | | | | | | |
|---|---|---|---|---|---|---|---|
| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
| Corrected Model | Berpikir Kritis | 3362,000[a] | 1 | 3362,000 | 38,868 | ,000 | ,447 |
| | Hasil Belajar | 220,500[b] | 1 | 220,500 | 4,645 | ,036 | ,088 |
| Intercept | Berpikir Kritis | 210990,080 | 1 | 210990,080 | 2439,239 | ,000 | ,981 |
| | Hasil Belajar | 268937,780 | 1 | 268937,780 | 5665,028 | ,000 | ,992 |
| MODEL | Berpikir Kritis | 3362,000 | 1 | 3362,000 | 38,868 | ,000 | ,447 |
| | Hasil Belajar | 220,500 | 1 | 220,500 | 4,645 | ,036 | ,088 |
| Error | Berpikir Kritis | 4151,920 | 48 | 86,498 | | | |
| | Hasil Belajar | 2278,720 | 48 | 47,473 | | | |
| Total | Berpikir Kritis | 218504,000 | 50 | | | | |
| | Hasil Belajar | 271437,000 | 50 | | | | |
| Corrected Total | Berpikir Kritis | 7513,920 | 49 | | | | |
| | Hasil Belajar | 2499,220 | 49 | | | | |

a. R Squared = ,447 (Adjusted R Squared = ,436)
b. R Squared = ,088 (Adjusted R Squared = ,069)

Based on table 11 Acceptance of H1 and rejection of Ho occurs if significant < a then Ho is not accepted and F count> Ftable. Based on the data obtained significant value of critical thinking 0.000 < 0,05 dengan membandingkan dengan Fhitung = 38,868 yang dibandingkan dengan Ftabel = 3.9819 dengan df1 =1 dan df2 = 48 (38,868 > 3.9819) so it is concluded that Ho is rejected and H1 is accepted then the average (Treatment). variable Y1 (Critical Thinking) shows a difference in variable X.

From the data above, it is obtained that the Concept Understanding data is 0.036 <0.05 then by comparison with Fcount = 4.465 which is compared to Ftable = 3.9819 with df1 =1 and df2 = 48 (4.465> 3.9819) so it is concluded that Ho is rejected and H1 is accepted Average Variable Y2 (Learning Outcomes) Shows Differences in Variable X (Treatment).

## IV. CONCLUSION AND SUGGESTION

### A. Conclusion

The research showed that the 5E Learning Cycle learning model combined with Wordwall media effectively improved the critical thinking skills of fifth grade students on ecosystem material. This is evidenced by the results of the normality and homogeneity tests which show normally distributed and homogeneous data, as well as the results of hypothesis testing which show a significant difference between the experimental and control classes. The increase in students' critical thinking skills was significant after the treatment, with a significance value (sig.) of 0.000 <0.05 and a much higher average difference in posttest scores in the experimental class.

In addition to critical thinking skills, this learning model also proved effective in improving student learning outcomes. This is shown by the results of the paired sample t-test analysis which shows a significance value of 0.036 <0.05, which means that there is a significant difference in learning outcomes between the experimental and control classes after the treatment is given. Thus, the use of the 5E Learning Cycle approach and Wordwall support is able to create a more interesting, interactive learning atmosphere, and facilitate students in understanding the concept of ecosystems as a whole.

Simultaneously, the results of multivariate analysis (MANOVA) reinforce the finding that there is a significant effect of the application of the 5E Learning Cycle model assisted by Wordwall media on two variables at once, namely critical thinking ability and learning outcomes. This is shown through the multivariate significance value of 0.000 as well as the results of the between-subjects effects test which shows significance in both dependent variables. Therefore, the application of innovative learning models such as the 5E Learning Cycle accompanied by interactive media such as Wordwall is recommended to be used in science thematic learning in elementary schools to encourage active learning, higher order thinking, and optimal learning outcomes.

**B. Suggestion**

1. Although this article successfully demonstrates the effectiveness of the 5E Learning Cycle model assisted by Wordwall media in improving students' critical thinking skills and learning outcomes, it has not fully explored external factors that may influence the results, such as students' socio-economic background, teachers' teaching style, and home learning environment support. This study has also not explained in detail how different student characteristics respond to Wordwall media, so generalization of the results needs to be done with caution. In the future, further studies are recommended to pay attention to these contextual variables so that the research results can be more comprehensive and representative.
2. The use of Wordwall as a learning media is interesting and interactive, but this article has not critically discussed the possibility of limited digital access in elementary schools, especially in areas with low technology infrastructure. The readiness of technological facilities and infrastructure should be an important part of analyzing the effectiveness of digital learning media. Without considering the digital divide, implementing media such as Wordwall could risk widening the gap in learning quality between schools that have access to technology and those that do not.
3. Methodologically, this article is quite strong in the use of experimental design and statistical analysis. However, qualitative aspects such as students' perceptions of learning with the 5E model and Wordwall media do not get enough portion. In fact, an in-depth understanding of students' learning experiences can enrich research results and provide more meaningful pedagogical insights for teachers. Therefore, a mixed methods approach can be an option for further research to obtain a more holistic picture of the effectiveness of this innovative learning.

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