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The Influence of Wordwall-Assisted PBL Model on Students' Conceptual Comprehension and Critical Thinking

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Abstract— ***Social studies learning in primary schools currently lacks the active involvement of students in the learning process, so they tend to be passive, which has an impact on their academic understanding and development. Many schools still implement one-way learning, so students are not given space to discuss or solve problems independently. This causes critical thinking skills to be underdeveloped, and understanding of concepts is limited to memorization without practical application. This study aims to examine the influence of the Problem Based Learning (PBL) model assisted by Wordwall on the concept comprehension and critical thinking skills of elementary school students. The Wordwall-assisted PBL model is expected to be a solution to both skills. This study uses a quantitative method with an experimental approach using a quasi-experimental design of nonequivalent groups pretest-posttest. The research sample was taken from two classes at SDN 1 Ciptomulyo, Malang City, which had an average score of almost the same. The research instrument is in the form of written tests (pretest and posttest) that have been tested for validity and reliability. Data were analyzed using normality, homogeneity, and independent-sample t-test hypothesis tests. The results of the t-test on concept comprehension showed a significance value (sig. 2-tailed) of (0.001 < 0.05), while critical thinking showed a significance value (sig. 2-tailed) of (0.001 < 0.05), which indicated a significant increase. Thus, it can be concluded that the Wordwall-assisted PBL model has an effect on students' understanding of concepts and critical thinking skills in class V science material at SDN 1 Ciptomulyo.***

Keywords—PBL; Wordwall; Understanding of concepts; Critical Thinking

I. INTRODUCTION

Education is the main foundation in building quality human resources. The educational curriculum in Indonesia continues to be improved to improve the quality of learning through the application of methods that activate student participation, especially in science learning (Wahyuni, 2022). Natural Science (IPA) learning at the elementary school level is important in forming students who have scientific understanding, skills, and attitudes (Kumala, 2016; Octaviana et al., 2023; Setyawan & Kristanti, 2021). In this science learning, students will learn many things in the surrounding environment and in daily life.

The main challenge in basic education is the low ability of students to understand concepts and think critically. Often, students have difficulty connecting lesson concepts to real-life situations and tend to memorize without fully understanding the

material. Concept comprehension refers to a person's ability to understand a certain concept (Handayani, 2016). In addition, learning develops critical thinking skills. Convergent thinking or critical thinking means thinking in one direction to find the most accurate answer or one best solution to a problem (Amalia & Kustijono, 2017; Ariani, 2020; Nuryanti et al., 2018; Syafitri et al., 2021). Critical thinking skills are important skills that need to be honed early (Amalia & Kustijono, 2017; Ariani, 2020) . However, many schools still implement one-way learning, so students are not given much space to discuss or solve problems independently. This causes critical thinking skills to be underdeveloped, and understanding of concepts is limited to memorization without practical application.

Based on the results of interviews with grade V teachers at SDN 1 Ciptomulyo, it can be seen that students' ability to understand concepts and think critically still needs to be further improved. The teacher explained that most students are able to grasp the basic concepts being taught, but they often still need a companion to deepen that understanding. In terms of critical thinking, the teacher noted that some students have begun to be able to analyze simple problems and ask questions, although not all students have done it consistently. The learning process that relies on group discussions and interactive questions and answers is considered effective in encouraging students' critical thinking, especially in subjects such as science. Based on this, teachers hope that with continuous training, students' critical thinking skills will be further developed, preparing them better to face academic challenges at a more advanced level. Based on this data, it can be seen that only about 35% of grade V students are able to understand concepts and think critically in science subjects. In this case, students are known to lack understanding of concepts and critical thinking. Many things affect the occurrence of this, for example, such as less supportive learning methods, lack of guidance in critical thinking, learning environment conditions, limited understanding of concepts, lack of student motivation to learn. Thus, in better learning, a way is needed to create a better learning environment.

From the above problems, students need interesting learning and are able to develop students' ability to understand concepts and think critically. Therefore, teachers also play an important role and are responsible for the learning process and outcomes of students. Thus, the researcher concluded that there is a need to improve the learning process at SDN Ciptomulyo 1 in grade V, namely by using the Wordwall-assisted PBL model in the hope that it can affect students' ability to understand concepts and think critically.

In the digital era, traditional learning methods are evolving to be more interactive and technology-based. One of the approaches that is widely applied is Problem-Based Learning (PBL), which invites students to think critically in analyzing and solving problems. The learning model has an equally important role in developing students' critical thinking skills (Qonita & Handayani, 2023). The PBL model is a learning model that presents problems that have occurred and then students are asked to find information through other learning resources by involving thinking skills and other skills both individually and collaboratively (Hariani & Siregar, 2019; Putri & Hamimah, 2023; Shofiyah & Wulandari, 2018). The Problem-Based Learning Model is learning that uses real problems as the first step in the learning process. Model implementation *Problem Based Learning (PBL)* not only focus on the mastery of declarative knowledge or material concepts, but also on the mastery of procedural knowledge, as well as learning that is associated with concrete problems in daily life (Rosidah, 2018; Setia Adi et al., 2023). According to (Shofiyah & Wulandari, 2018) Type *Problem Based Learning* (PBL) has steps in its implementation, namely: *1).* Orient students to problems, *2).* Organizing students to learn, *3).* Guiding independent and group research, *4).* Develop and present the work, *5).* Analyze and evaluate the problem-solving process. So that every student is actively involved in finding this information.

To increase its effectiveness, interactive media such as *Wordwall* can be used to make learning more interesting for elementary school students. *Wordwall* is an interactive learning platform that helps students be more active in learning through quizzes, discussions, and educational games. In addition to being an evaluation medium, *Wordwall* It also makes it easier for teachers to design interesting activities that increase students' interest in learning (Mujahidin et al., 2012; Octaviana et al., 2023; Purnamasari et al., 2022; Sari & Yarza, 2021). Activities created through *Wordwall* can be accessed online or offline with a variety of templates available and can be customized to your learning needs.

The PBL model is an effective approach that affects students' understanding of concepts and critical thinking skills. Based on constructivist theory, learning through problem-solving leads students to learn actively by associating the concepts learned with reality. Constructivism is constructive. In the context of the philosophy of education, constructivism is an effort to build a modern cultural life structure (Suparlan, 2019). Constructivism theory works by emphasizing students' activities in building understanding, not just memorizing information, through exploration, reflection, and social interaction, learning becomes more meaningful and encourages students to think critically. PBL allows students to explore problems and find solutions on their own, which strengthens their understanding of concepts and critical thinking skills. *Wordwall* as a learning gamification tool can be

used in PBL to increase interest and interactivity in the learning process. Through *Wordwall*, students can take part in various activities such as quizzes, games, and puzzles that match the material. *Wordwall* designed to make learning more enjoyable, so that students' motivation to learn and understanding of concepts increases.

Application of the assisted PBL model *Wordwall* It is expected to be a solution in overcoming students' low understanding of concepts and critical thinking skills. The combination of problem-solving methods and interactive media allows students to think more deeply and actively understand concepts and find solutions. *Wordwall* Facilitate interesting learning that can increase students' motivation, so that they are able to think critically and understand the material better. Problem-Based Learning (PBL) model *wordwall* has a great influence on students' ability to understand concepts and think critically in science learning. Through the PBL model, students are encouraged to solve real problems using analysis and problem-solving activities, which help deepen their understanding of concepts as students are exposed directly to the material in the application. *Wordwall* is an online-based digital game application that provides a wide selection of games and quizzes that can be used by teachers to help with learning evaluation (Husna & Anita, 2024; Khairunisa, 2021; Maghfiroh et al., 2018; Purnamasari et al., 2020). *Wordwall* It functions as a gamification tool, making learning more interactive and fun, and making it easier for students to concentrate and be motivated when learning material concepts, as well as developing students' critical thinking skills, because they need to design strategies, analyze information, and provide solutions to the problems they face (Educational, 2025; Malang, 2023). This study shows that the combination of PBL and interactive media such as *Wordwall* has a positive impact on students' ability to understand concepts and think critically. This model allows students to build their understanding of concepts as well as strengthen analytical and critical abilities in challenging learning situations.

Similar previous research has been conducted (Pramesti et al., 2024) with the title "Development of Learning Media Using *Wordwall* Based on PBL in Science Subjects Class V SDN Darmorejo 01", revealed that the learning media used in the learning process does have a very large influence on student learning outcomes, thus the use of *Wordwall* PBL-based proven to be successful. Based on this, the solutions and novelties used by the researcher in this study are the emphasis on the influence of the application of the assisted PBL model *Wordwall* to two important aspects, namely the understanding of concepts and the critical thinking ability of students in elementary school. With this, the researcher hopes that students can be actively involved in the teaching and learning process so that students can understand the learning material with the use of the assisted PBL model *Wordwall*. Based on the above problems, it can be concluded that the purpose of this study is to determine the influence of the use of the assisted PBL model *Wordwall* on the ability to understand concepts and think critically of grade V students at SDN Ciptomulyo 1 Malang City.

II. METHOD

This study uses a quantitative approach with a quasi-experimental design, precisely nonequivalent groups pretest-posttest design.

Table 1. Research Design

Grub	Pretest	Treatment	Post-test
Eksperimen	O1	X1	O2
Control	O3	X2	O4

(source : (Scott, 2013))

Two groups, namely the experimental class and the control class, will be involved in this study.

Class	Number of Students
Class V B	24
Experimental Class V A	26
Control Class V C	26

The experimental group will receive learning using the assisted PBL model *Wordwall*, while the control group will use a contextual learning model based on PPT media. In the implementation of learning, it will be in accordance with the indicators of concept understanding and critical thinking. Indicators of concept understanding according to (Pranta, 2016)that is: *1).* Repeating the concept, *2).* Classifying objects based on specific characteristics, *3).* Providing examples and counter-examples of a concept, *4).* Presenting concepts in mathematical form, *5).* Formulate the necessary and sufficient conditions for a concept, *6).* Selecting and utilizing appropriate procedures or operations*, 7).* Grouping concepts or agglorhythms in problem solving. As for the critical thinking indicator, according to (Ennis, 1993), i.e.: Provide simple explanations, Build basic skills, Conclude, Make further explanations, strategies and tactics.

The research sample was taken from class V at SDN 1 Ciptomulyo Malang City including classes V A, V B, and V C which have almost the same average score, selected based on certain criteria and ease of access, without involving random selection. Class V B is a class that is used as a class to test validity and reliability by working on 30 questions. Where valid and reliable questions will be used as pretest and posttest questions which will be used in Class V A as an experimental class and Class V C as a control class.

The research instruments for the control and experimental classes consisted of a Learning Implementation Plan (RPP) and a written test (pretest and posttest). Data is collected through observation, testing, and documentation. Data analysis is carried out after all the data needed by the researcher has been collected. The analysis steps include a prerequisite test, namely normality and homogeneity test, and ends with a hypothesis test.

The normality test is used to verify whether the data has a normal distribution. The data used in the normality test of this study are the data of the initial test (*Pretest)* and the data of the test questions after treatment (*Posttest)* in classes V A and V C. The normality test used is the *Shapiro test wilk* using the help of SPSS 22 *for windows.* Where if *the Shapiro Wilk* test value shows a value greater than (sig ≥ 0.05) then H_a is accepted, which means that it can be stated that the data is normally distributed. Conversely, if *Shapiro Wilk*'s significance value is less than α (sig ≤ 0.05) then $H_{a\ is}$ rejected.

Homogeneity tests are used to see if variation within several population groups is similar or different. In this study, the homogeneity test used *the Statistical Lavene test,* with a significance level of α = 0.05 assisted by the SPSS 22 *for windows application.* If the value of *the statistical significance of Lavene* is greater than α (sig ≥ 0.05) then H_a is accepted, so it can be stated that the two sample classes used are in a population whose data variance is homogeneous.

Hypothesis testing was carried out to find out whether the hypothesis proposed in this study was accepted or rejected. The data analyzed in this study are data on students' concept understanding and critical thinking skills obtained from *pretest* and *posttest scores* between the experimental class and the control class. In this study, a hypothesis test was used with the T-test analysis technique with the help of SPSS 22 *for windows.*

The formulation of the hypothesis in this study includes two problem formulations. In the formulation of the first problem, namely concept comprehension, hypothesis zero (H_0) states that the use of Wordwall-assisted PBL model has no effect on improving students' concept comprehension ability. On the other hand, the alternative hypothesis (Ha) states that the use of the wordwall-assisted PBL model has an effect on improving students' conceptual comprehension skills. Meanwhile, in the formulation of the second problem, namely critical thinking, hypothesis zero (H_0) states that the use of the Wordwall-assisted PBL model has no effect on improving students' critical thinking skills. On the other hand, the alternative hypothesis (Ha) states that the use of the Wordwall-assisted PBL model has an effect on improving students' critical thinking skills. Hypothesis testing was carried out at the significance level (α = 0.05) with the following criteria: if the value of t is calculated to be smaller than the value of t table (*t count ≤ t table),* then the alternative hypothesis (Ha) is accepted and the null hypothesis (H_0) is rejected. Conversely, if the value of t is greater than the value of t of the table (*t count ≥ t table),* then hypothesis no (H_0) is accepted and the alternative hypothesis (Ha) is rejected.

III. RESULTS AND DISCUSSION

In this study, the validity of the instrument was tested in class V B consisting of 24 students. The method used to test validity is the analysis of question items. To measure the level of validity of the questions, the researcher used the help of SPss 22 *for windows.* A question item is declared valid if the value r is greater than r of the table (r is calculated > of r table), which means that the alternative hypothesis (Ha) is accepted and the null hypothesis ($H_{0)}$ is rejected, and vice versa.

Based on the data that has been analyzed, it can be found that the question items with numbers (3, 4, 5, 7, 9, 11, 13, 18, 20, 24, 26, 27, 28, 29, and 30) have a calculated r value greater than 0.404 (r count > 0.404), so that the question item is declared valid. Meanwhile, numbered question items (1, 2, 6, 8, 10, 12, 14, 15, 16, 17, 19, 21, 22, 23, and 25) have a calculated r value of

less than 0.404 (r count < 0.404), which means that the question item is invalid. Thus, there are 15 valid questions and 15 invalid questions.

In addition to testing the validity of the question items, the next step is to conduct a reliability test. This test aims to assess the extent to which the measurement instrument is reliable, stable, and consistent in producing data. The reliability test was carried out using the Cronbach's Alpha method, where an instrument is categorized as reliable if the value of Cronbach's Alpha is greater than 0.60 (Cronbach's Alpha > 0.60). The results of the analysis showed that the Cronbach's Alpha value obtained was 0.809 which was higher than the minimum limit of 0.60 (0.809 > 0.60). This shows that the research instruments used have a good level of consistency, so they can be categorized as reliable.

Furthermore, in the normality test, the data analyzed included the results of the initial test (pretest) and the results of the posttest test in students of classes V A and V C. normality testing was carried out using the Shapiro-Wilk method with the help of SPSS 22 *for windows.* The results of the normality test analysis on concept understanding showed that the significance value for the control class pretest was 0.424, the control class posttest was 0.964, the experimental class pretest was 0.296, and the experimental class posttest was 0.355, all of which were greater than 0.05, so it can be concluded that the data is normally distributed. Meanwhile, the results of the critical thinking normality test showed that the significance value of the control class pretest was 0.067, the control class posttest was 0.402, the experimental class pretest was 0.086, and the experimental class posttest was 0.069, where all of these values also met the criteria ≥ 0.05, so it can be concluded that the critical thinking data in this study is normally distributed.

The homogeneity test in this study was carried out using *the Statistical Lavene test,* with a significance level of α = 0.05 with the help of the SPSS 22 *for windows application.* To ensure that the pretest and posttest data in both the control class and the experimental class have a homogeneous variance, the significance value obtained in the Based on Mean category must be greater than 0.05 (>0.05). If the conditions are met, it can be concluded that the data variance in this study is homogeneous.

The results of the homogeneity test conducted on the concept understanding pretest showed that the significance value (sig.) in the Based on Mean category was 0.333. Since this value is greater than 0.05 (0.333 > 0.05), it can be concluded that the variance of the data in this study is homogeneous. For the concept understanding posttest, a significance value of 0.250 was obtained. With this value which is also greater than 0.05 (0.250 > 0.05), the concept understanding posttest data has a homogeneous variance. In the homogeneity test of the critical thinking pretest, the results of the analysis showed a significance value of 0.386. Since this value exceeds the limit of 0.05 (0.386 > 0.05), it can be concluded that the variance of the critical thinking pretest data is homogeneous. Meanwhile, the results of the homogeneity test for the critical thinking posttest showed a significance value of 0.748. With a value greater than 0.05 (0.748 > 0.05), the critical thinking posttest data in this study also had a homogeneous variance. Overall, the results of the homogeneity test of concept understanding and critical thinking showed that all significance values (sig.) in the Based on Mean category were greater than 0.05. Thus, it can be concluded that the variance of pretest and posttest data, both in the control class and the experimental class, is homogeneous for both the variables tested.

Table 4. Independent Samples t-test Concept Understanding

	Class	N	Mean	Std. Deviation	Std. Error Mean	Sig.(2-tailed)
Posttest	Control Class	26	56.65	13.112	2.571	<.001
	Experimental Classes	26	82.04	10.634	2.085	<.001

Based on the results of the Independent T-test on the concept understanding data, a significance value (sig.2-tailed) of 0.001 <0.05 was obtained. This shows that H_0 is rejected and H_a is accepted. Thus, it can be concluded that there is a difference in the average score of students' understanding of concepts based on the posttest results. In the control class that used the PPT-based Contextual learning model, the average score obtained was (56.65), while in the experimental class that applied the problem-based learning model (PBL) assisted by *Wordwall,* the average score was obtained (82.04). In other words, there was a significant difference in the value of students' conceptual understanding of science materials between those who learned with the PPT-based contextual learning model and those who used the Wordwall-assisted PBL model in class V.

Tabel 5. Independent Samples t-test Berpikir Kritis

	Class	N	Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Posttest	Control Class	26	48.08	17.151	3.364	<.001
	Experimental Classes	26	73.46	13.694	2.686	<.001

Based on the results of the Independent T-test on critical thinking data, a significance value (sig.2-tailed) of 0.001 <0.05 was obtained. This shows that H_0 is rejected and H_a is accepted. Thus, it can be concluded that there is a difference in the average score of students' critical thinking based on the posttest results. In the control class that used the PPT-based Contextual learning model, the average score obtained was (56.65), while in the experimental class that applied the problem-based learning model (PBL) assisted by *Wordwall,* the average score was obtained (82.04). In other words, there was a significant difference in students' critical thinking scores on science materials between those who learned with a PPT-based contextual learning model and those who used the Wordwall-assisted PBL model in grade V.

Based on the results of the independent T-test on the pretest and posttest data, a value (sig. 2-tailed) (0.00) < 0.05 was obtained in both classes of concept understanding and critical thinking, both experimental and control classes. The data obtained showed significant differences between the control class and the experimental class, namely the control class with the PPT-Based CTL learning model and the experimental class using the assisted PBL model *Wordwall.*

The difference occurs because students who participate in learning using the PBL model are assisted *Wordwall* having the opportunity to know and understand the material is easier because it involves the real world that is associated with daily life as well as with visual media such as *Wordwall*, all packaged in engaging and interactive learning. In line with research (Hariani & Siregar, 2019; Shofiyah & Wulandari, 2018; Subagja, 2023) that learning with the PBL model is learning that utilizes problems from the real world as a framework for students to develop critical thinking skills and problem-solving skills, as well as gain an understanding and important concepts from the subject matter studied. The learning model has an equally important role in developing students' critical thinking skills (Qonita & Handayani, 2023).

The results of research that occurred in the field showed that the application of the PBL model with the help of *Wordwall* encourage students to be more active in the learning process. With this model, the use of lecture methods by teachers can be minimized, so that students have more opportunities to develop their skills, such as their concept understanding and critical thinking. Using the assisted PBL model *Wordwall,* Students gain the opportunity to actively participate in asking questions and discussing learning, which ultimately encourages the creation of new insights (Husna & Anita, 2024; Tarbiyah et al., 2023).

This is in line with research conducted by (Octaviana et al., 2023) which shows that the application of the PBL learning model helps *Wordwall* evident affects Science Learning Outcomes of Students. The use of learning media in the teaching and learning process does have a very large influence on improving student learning outcomes, thus the use of *Wordwall* PBL-based proven to be effective (Pramesti et al., 2024). As well as research (Ma'rifah, 2024) revealed that although the numeracy ability of grade III students is relatively low, the application of PBL learning is assisted *Wordwall* able to have an influence on their learning process. Furthermore, the use of PBL based on Gamification *Wordwall* also contributes to students' critical thinking skills, with results showing an increase in critical thinking skills, where students feel greatly helped by this learning method (Fitriana & Indriyani, 2024).

IV. CONCLUSION

From the findings of this study, it can be concluded that the use of the Wordwall-assisted PBL model has been proven to be influential and has a positive impact on students' ability to understand concepts and think critically in elementary school. *Wordwall* as an interactive learning media in PBL encourages students to be more active during the learning process, reduce the dominance of lecture methods by teachers, and create a more interesting, challenging, and more interactive learning atmosphere.

Students' understanding of concepts increases because they are more involved in exploring and building their own knowledge and honing their understanding of the material through the questions contained in Wordwall. Meanwhile, students' critical thinking skills also develop significantly because this model requires them to analyze, evaluate, and connect the information they have learned in more depth. Thus, the implementation of Wordwall-assisted PBL in elementary schools can be an effective learning method for better learning quality. This model not only helps students understand concepts better, but also trains critical thinking skills that are crucial in facing future Education challenges.

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