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Project-Based Learning Model Based on the Utilization of Used Goods on Students' Creative Thinking Skills on Water Cycle Materials

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ABSTRACT

The learning process will be more fun if it is student-centered because students are free to explore and create according to their abilities by integrating the benefits of used items as a learning medium to help students understand the water cycle material. This study aims to determine whether the creative thinking ability of grade V students is affected by a project-based learning model based on used goods. The research method used was a quasi-experimental design of the Non Equivalent Control Group pattern. The results show that students' creative thinking ability towards water cycle material is influenced by a project-based learning model based on used goods. A separate sample t-test or an independent sample t-test assisted by SPSS version 25 showed that it was 4,725 ≥ 1,988, so Ha was accepted and H0 was rejected. The scores of the experimental and control classes were both higher. according to the score of the grades obtained. However, the value of the experimental class is greater than that of the control class. The results of the TTCT study showed that the experimental score was higher than that of the control class. The conclusion of this study is that the project-based learning model based on the use of used goods affects students' creativity in water cycle materials.

INTRODUCTION

21st century education has undergone a transition in learning. The newly created curriculum encourages schools to change their approach to learning. Previously, Teacher Centered became Student Centered. 21st century education is a golden generation that has skills, namely human beings who are collaborative, critical thinking, communicative, innovative, creative, characterful, and able to compete (Hakim et al., 2024; Muyambo-Goto et al., 2023; Wajdi et al., 2024). The Healthy Thinking Skills System builds at least one channel from Thinking Skills on personal decisions to personal responsibility for each current self. The Four Integrated Steps in Heasly's Thinking Skills System need to be shaped into the concept of Sustainability and Security for 21st century use Husain, 2019; (Heasly et al., 2021; Muyambo-Goto et al., 2023). Learning strategies in the 21st century emphasize a learning process that encourages students to have critical, innovative & creative, communicative, collaborative, and student-centered thinking skills (Baharuddin et al., 2022; Habsy et al., 2024; López, 2022). One

of the efforts to achieve the 21st century learning strategy is the concept of creativity and innovation learning, which means that students in this concept get used to doing and explaining every idea that comes to their mind. Creative thinking is the ability to think to plan, make changes, solve problems, improve, and obtain new ideas (Herman et al., 2022; Leijten, 2019; Maor et al., 2023).

The application of creative concepts in the 21st century requires a learning model that directs students to be active and creative in finding new ideas. The learning model is the approach used by teachers so that learning objectives can be realized. A student-centered approach is a teaching and learning method that puts students' needs and interests at the center of the educational process. It emphasizes student engagement, collaboration, and autonomy, aiming to create a learning environment that is supportive, challenging, and aligned with students' needs and goals (Kerimbayev et al., 2023; Shehata et al., 2024). The learning model is very important to be implemented so that students have an interest in learning and participate in learning activities well. A modern learning model that increases student creativity is a project-based learning model with this model students are able to explore science in real experiences in the surrounding environment. Project-based learning is an educational approach, namely the process of inquiry into complex and real problem-solving, as well as the process of designing project-based works in a complex manner, planning and executing tasks so that students can master the knowledge and skills needed (Cai et al., 2023; Dianawati, 2022). The project-based learning model is a learning approach that creates a constructivist learning environment, namely conditioning students to build their own knowledge abilities. Project-based learning supports curriculum integration because it engages students in learning experiences related to the real world (Hu, 2023; Zhao et al., 2023). Through the surrounding environment, students can create a concept of knowledge by utilizing used goods to produce a work that is used as a learning medium in the process of understanding water cycle material. The process of making the water cycle in the project making activity has the value of science knowledge integrated in the subject matter

Based on the findings from interviews and observations, students still have low creative thinking skills as seen from students who are less active during the learning process. The characteristic of creative students is that they have high curiosity but students do not show this, students' thinking skills are considered less than optimal because in completing a task or question students are still looking for the right or right answer, in addition, there is no good habit in techniques and practice questions that encourage student creativity. The characteristic of creative thinking is that students must be able to find various answers to the problems given so that they are encouraged to have broad thinking skills. The project-based learning model is one of the interactive models that teachers can use to enhance their students' creativity. This is in accordance with a study conducted by Ria, et.al (2022) which shows that there is an influence on children's creativity in the use of the PjBL model based on the use of used goods. The results of Mokambo's (2021) research show that there is an influence of student creativity in the use of project-based learning models. The results of Maharani's (2020) research show that the creation of an attitude of caring for the environment in the use of a project-based learning model by utilizing used goods as a learning medium and can hone students' creative thinking skills and care for the environment in making respiratory organ media.

This study has a difference from other researchers, namely, most project-based learning models look at how students learn and still rarely use the use of used materials related to water

cycle materials by looking at students' creative thinking skills. In the learning process, it will be more fun if it is student-centered because students are free to explore and create according to their abilities by integrating the benefits of used items as a learning medium to help students understand the water cycle material. Based on the background that has been presented, research will be carried out, namely "*Project-based Learning (PjBL) Model Based on the Utilization of Used Goods on Students' Creative Thinking Skills in Water Cycle Material*".

METHOD

This study used a quasi-experimental type referring to (Creswell & J. David, 2018). The purpose of experimental research was to find out whether a certain treatment had an impact on changing conditions. In this study, compare one or more experimental variables (who received treatment) with one or more control variables (who did not receive treatment). A pseudo-experimental, or almost experimental, method with a Non-Equvalent Control Group pattern was used. The homogeneity test was used to determine the control class and the experimental class. The homogeneity test was carried out using a test. Levene, which was used with SPSS version 25.

According to the interpretation of the Levene test, the variance of the data was equal or homogeneous if the statistical value of Levene was greater than 0.05. Based on the results that have been obtained, the two classes were considered homogeneous because their significance value of 0.101 was greater than 0.05. The next stage of the development of the instrument validity test instrument had the purpose of knowing the validity of each question item that would be used, after which a normality test was carried out to see if the data was distributed normally. This study conducted a normality test with Shapiro Wilk and the SPSS version 25 program. The data was normally distributed if the significance value was greater than 0.05. The next Separate sample t-test, also known as an independent sample t-test, was used in data analysis techniques to calculate the difference in the pretest and posttest results of the two classes.

RESULT

Based on the data above, the average difference between *the pretest* and *posttest* scores in class B was 32.05 and in class A was 23.19. The data shows that there was a comparison of *posttest* scores with the average score in the experimental class was greater when viewed from the results of the control class. The next step was to carry out a normality test and a separate sample t-test which aimed to see the influence of a treatment of a project-based learning model used by utilizing used items to measure the level of students' creativity ability through tests and observations produced.

Furthermore, analyze the normality test used, namely the *Shapiro Wilk* statistical test assisted by SPSS version 25. It was used to test whether the data was normally distributed or not. Based on the results obtained, the results of the experimental *pretest* significance value of 0.343 > 0.05 and the results obtained of the *control pretest* were 0.105 > 0.05 and the results of the *posttest* significance value of the experimental class of 0.115 > 0.05 and the control class of 0.749 > 0.05, it was concluded that the two classes were normally distributed. Therefore, the data from both classes was distributed normally. This means that the assumption of normality is met, and statistical analysis that requires normally distributed data can be performed validly. Because the results *of the Shapiro Wilk test* show that the data from the pre-test and post-test of the two classes were normally distributed, the assumption of normality was met. Normity assumptions

are an important requirement in conducting parametric statistical analyses such as t-tests, ANOVAs, and linear regression.

Table 1. Average Scores of Experimental and Control Classes

Component	Average Score	
	Experimental Classes	**Control Classes**
Number of Students	42	42
Pretest	50.47	49.00
Posttest	82.52	71.98
Average Difference	32.05	22.98

Test of Normality

In this study, the t-test was then used, namely test score data after being carried out in the experimental and control classes. The t-test used is posttest score data in both classes. A hypothesis test was carried out to compare the tcount with the table at a significance level of 0.05 or 5%. The t-test results obtained using SPSS version 25 were calculated at 4,725. As for ttable (82), which was 1,988, the result can be concluded that the tcount ≥ ttable was 4,725 ≥ 1,988. Based on the data obtained, the results of Ha accepted H0 were rejected with the statement that the project-based learning model by utilizing used goods for grade V students of water cycle material was able to improve creative thinking skills. As for after conducting a hypothesis test, the next step was to determine the relative level of effectiveness Based on the results of the calculation above, it showed that the project-based learning model based on used goods was 33% more effective than the small group discussion model. Based on the pretest and posttest scores, the following graph showed the benchmark of student creativity in class B and class A

Table 2. Normality Test

Test Results	***Shapiro-Wilk***		
	Statistic	**Df**	**Mr.**
Pre-test experiments	.971	42	.343
Post-test experiments	.961	42	.115
Pretest Control	.956	42	.105
Posttest Control	.982	42	.749

Measuring students' creative thinking ability has a level in each indicator to see the comparison achieved with the results done by students. The following is a description that describes the table data containing the results of the comparison between the experimental class and the control class regarding the level of students' creative thinking ability which was measured based on several aspects, namely *fluency* (fluency of thinking), *flexibility* (flexibility of thinking), *originality* (uniqueness of ideas), and *elaboration* (elaboration ability). On the fluency indicator, students in the experimental class obtained a score of 85 which was included in the creative category. Meanwhile, students in the control class got a score of 76 which was included in the category of quite creative. In the flexibility indicator, students in the experimental class obtained a score of 81 which was included in the creative category. Meanwhile, students in the control class got a score of 69 which was included in the category of quite creative.

On the originality indicator, the experimental class obtained a score of 85 and was included in the creative category. Meanwhile, the control class obtained a score of 76 with a fairly creative

category. In the elaboration indicator, students in the experimental class again showed better performance with a score of 82 in the creative category. Meanwhile, the control class obtained a score of 68 with a fairly creative category. Therefore, the experimental class had a higher score in each indicator of creative thinking ability compared to the control class. This indicated that the learning methods used in the experimental class, both project-based and interactive, are able to improve students' creative thinking skills more effectively than the methods applied in the control class. Here are the calculation results of each indicator.

Table 3. TTCT Test Score Analysis

Indicators of Creative Thinking Ability	Question	Experimental Classes		Control Classes	
		Shoes	Category	Shoes	Category
Fluency	2.4.12	85	Creative	76	Quite Creative
Flexibility	3.7.9.11.13	81	Creative	69	Quite Creative
Originality	6.10	85	Creative	76	Quite Creative
Elaboration	1.5.8.14	82	Creative	68	Quite Creative

Furthermore, when giving a treatment, observation and observation are carried out on each group. The following is a description of the table data that contains the results of the comparison between the experimental class and the control class related to students' creative thinking indicators which were measured based on several aspects, namely *fluency* (fluency of thinking), *flexibility* (flexibility of thinking), *originality* (uniqueness of ideas), and *elaboration* (elaboration ability). In the fluency indicator, students in the experimental class obtained an average score of 81 which was included in the creative category. Meanwhile, students in the control class got a score of 73 which was included in the category of quite creative. In the flexibility indicator, students in the experimental class obtained a score of 87 which is included in the creative category. Meanwhile, students in the control class got a score of 75 which was included in the category of quite creative.

On the originality indicator, the experimental class obtained a score of 82 and was included in the creative category. Meanwhile, the control class obtained a score of 74 with a fairly creative category. In the elaboration indicator, students in the experimental class again showed better performance with a score of 87 in the creative category. Meanwhile, the control class obtained a score of 76 with a fairly creative category. Therefore, the experimental class that used the project-based learning model showed a higher level of creativity across all indicators compared to the control class. This indicates that project-based learning is able to support the development of students' creative thinking more effectively.

Table 4. Observation Score Analysis

Indicator	Question	Experimental Classes		Control Classes	
		Shoes	Category	Shoes	Category
Fluency	1.2.10	81	Creative	73	Quite Creative
Flexibility	4.5.6	87	Creative	75	Quite Creative
Originality	3.7	82	Creative	74	Quite Creative
Elaboration	8.9	87	Creative	76	Quite Creative

DISCUSSION

The results of the data collected show that the project-based learning model has an important impact on students in directly appreciating participating in learning activities so that

they can be creative, create a work, build new knowledge or ideas in a product and solve a given problem so that it can encourage students to be able to have high creative thinking skills. This learning model is very good for students because students directly play an active role in learning activities based on the student's environment, this is in line with the theory of constructivist learning which means that students can explore their own abilities in finding information or material concepts.

Project-based learning supports curriculum integration because it engages students in learning experiences that are related to the real world. Through the surrounding environment, students can create a concept of knowledge by utilizing used goods to produce a work that is used as a learning medium in the process of understanding water cycle material. The process of making a water cycle in project making activities has the value of science knowledge integrated in the subject matter (Dianawati, 2022; Hu, 2023). The process of creating a project automatically integrates the values of scientific knowledge, especially in the aspects of observation, experimentation and evaluation. Students can observe the phenomena imitated through the project and relate them to the material in the textbook. Students also learn about how natural phenomena work, as well as the importance of recycling and utilizing scraps to create things.

The project-based learning model with the use of used goods contains values that can be reflected in their lives, where students can find out that used goods that were not used can be goods that can be a source of learning for them. In addition, it provides students with an understanding of the awareness of a healthy and clean environment. The project-based learning model is a learning approach that creates a constructivist learning environment, namely conditioning students to build their own knowledge abilities. Project-based learning supports curriculum integration because it engages students in learning experiences related to the real world (Cai et al., 2023; Hu, 2023; Zhao et al., 2023). Using used items as a project in learning can attract students' creative thinking skills while providing an understanding of conceptual material in learning. Integrating the surrounding environment by utilizing used items as a learning resource through the media made by students can directly gain new knowledge, so that in the learning process it is not the teacher who is the center of learning but the students who are the main part of the learning activity to add insight related to the potential of used goods that can be used as a work or product.

Project-based learning is a hands-on teaching approach that encourages students to build their own knowledge and skills development through guided activities centered on central questions (Chiu, 2020; D. Yang et al., 2021). Studies show that students' motivation and self-efficacy are positively influenced by the implementation of project-based learning. Project-based learning fosters students' communication and collaboration skills in classroom learning activities. Project-based learning is a useful teaching strategy to encourage students to be more creative in learning (Wahyudi & Fitriani, 2021; H. Yang et al., 2024). Project-based learning also helps students develop critical, creative, and problem-solving skills alongside the student's knowledge base. On the contrary, the implementation of project-based learning has a considerable impact on student learning value through creative thinking.

Based on the results obtained, the use of the project-based learning model is only 33% more effective than the cooperative model (*small group discussion*). Many things can affect students' creative thinking abilities according to (Dianawati, 2022; Maor et al., 2023; Winata, 2020). There are external and internal factors such as personality factors, motivation from the surrounding environment and cognitive. Although the effectiveness value is low, the results of the t-test

analysis show that there is a positive influence in using the project-based learning model by utilizing used goods. Therefore, it can be concluded that there is an influence of the project-based learning model on students' creativity in water cycle materials. Although the results show that the effectiveness value of the project-based learning model may be relatively low, the t-test analysis shows a significant positive influence on its application, especially when using used goods as part of learning. The project-based learning model provides space for students to engage in creative thinking processes, especially in practical and contextual contexts such as utilizing scraps to create water cycle-related projects.

CONCLUSION

A separate sample t-test or an independent sample t-test assisted by SPSS version 25 showed that it was 4,725 ≥ 1,988, so Ha was accepted and H0 was rejected. The scores of the experimental and control classes were both higher. according to the score of the grades obtained. However, the value of the experimental class is greater than that of the control class. The results of the TTCT study showed that the experimental score was higher than that of the control class. The project-based learning model has an important impact on students in directly appreciating participating in learning activities so that they can be creative, create a work, build new knowledge or ideas in a product and solve a given problem so that it can encourage students to be able to have high creative thinking skills. The project-based learning model has been proven to have a positive impact on students' creative thinking ability, so it is recommended that this model be applied more widely, especially in materials that require the development of student creativity such as in science, art and technology subjects.

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