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The effectiveness of project-based learning (PjBL) in improving the pancasila student profile (P3) of fourth grade elementary school students in Indonesia

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Abstract

This study aims to evaluate the effectiveness of the Project-Based Learning (PjBL) model in improving the Pancasila Student Profile (P3) of fourth-grade elementary school students. The study used a quasi-experimental design, comparing the experimental group that implemented PjBL with the control group that used conventional learning. The results showed that students in the experimental group experienced a significant increase in their Pancasila Student Profile scores compared to those in the control group. These findings indicate that the PjBL model is more effective in developing the Pancasila Student Profile, particularly in supporting learning that is oriented towards character building and 21st-century competencies. Therefore, PjBL has the potential to become a strategic learning approach for elementary school learning practices and the implementation of the Merdeka Curriculum.

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1. Introduction

The main factor determining whether a country is developed is the quality of its education. Education is the backbone of a nation (Alam et al., 2020). Basically, education serves to develop abilities and shape the character and civilization of a dignified nation, thereby educating the nation (Utomo et al., 2020; Kuswari et al., 2019). From an early age, the quality of human resources needs to be continuously improved, as this is essential and requires proper attention (Prasad & Pushpa, 2020). Education provided at the elementary school level is aimed at developing personal lives and the lives of the community and its citizens. In this case, elementary school students are also prepared to undergo the next stage of education, namely secondary education. From an early age, the quality of human resources needs to be continuously improved, as this is essential and requires careful attention.

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In line with these objectives, the Merdeka Curriculum is designed to provide students with space to learn in a meaningful, contextual, and student-centred manner, enabling them to develop academic competencies and character in accordance with the values of Pancasila. In this context, the Pancasila Student Profile (P3) serves as the main foundation for the implementation of national education, as stated in Permendikbud Number 22 of 2020 regarding the Ministry of Education and Culture's Strategic Plan for 2020-2024 (Shofa, 2021). The Pancasila Student Profile was created in response to global challenges, including technological advances, socio-cultural shifts, environmental changes, and the demands of the future world of work.

The Pancasila Student Profile is interpreted as a process of shaping Indonesian students with global competencies and character in accordance with the noble values of Pancasila (Kahfi, 2022; Kurniastuti & Feriandi, 2022). The six main dimensions of the Pancasila Student Profile are faith and noble character, independence, critical thinking, creativity, cooperation, and global diversity, which require active, collaborative, and contextual learning. Therefore, the implementation of the Pancasila Student Profile cannot be separated from the selection of learning models that are appropriate and relevant to the characteristics of elementary school students.

Based on the results of preliminary observations conducted at SDN 017 Pandau Jaya to obtain a realistic picture of the implementation of the Merdeka Curriculum, it was found that the learning implementation has not fully supported the optimal achievement of the Pancasila Student Profile. Teachers have not yet applied the Project-Based Learning (PjBL) model, and the learning process is still dominated by conventional methods, such as lectures, in which teachers explain the material while students tend to listen and complete assigned tasks. This condition is influenced by the transition from pandemic to endemic, leading teachers to choose methods considered more practical for classroom management.

This teacher-centred approach has led to low student engagement in the learning process, directly affecting the achievement of the Pancasila Student Profile dimensions. The observation results show that the values of cooperation, independence, creativity, and critical thinking skills have not developed optimally. Students tend to be passive, lack training in working together in groups, do not yet demonstrate independence in completing tasks, and are unable to express ideas and thoughts critically. This condition has implications for the low quality of educational outcomes, particularly in terms of character building and 21st-century competencies, which are the main objectives of the Merdeka Curriculum. Although the Pancasila Student Profile is the main focus of national education policy, findings from SDN 017 Pandau Jaya indicate a gap between the curriculum objectives and classroom practices. To date, there has been little empirical research specifically examining the effectiveness of the PjBL model in improving the Pancasila Student Profile in elementary schools, which are still predominantly conventional.

To accommodate and optimize the development of the Pancasila Student Profile, a learning model that encourages active student involvement is needed, such as Project-Based Learning (PjBL). Theoretically, PjBL is rooted in constructivist learning theory, which emphasizes that students actively construct knowledge through meaningful learning experiences. Through PjBL, students can work independently and collaboratively on real projects, thereby developing knowledge, attitudes, and skills in an integrated manner. PjBL was chosen because it provides students with space to learn in a contextually and realistically relevant, product-oriented way. This learning method is expected to improve learning outcomes and student character, as students are directly involved in a complex learning process. This is supported by research by Alamsyah et al. (2021) on project-based learning, which shows that learning outcomes improve more for students who learn through project-based learning than for those who learn through

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conventional learning. This aligns with Santyasa et al. (2020), who argue that Project-Based Learning (PjBL) also improves learning achievement in Natural Sciences (IPA) compared to conventional learning.

Project-Based Learning (PjBL) is a creative and innovative learning method that is student-centred and positions teachers as motivators and facilitators (Surya et al., 2018; Montepara et al., 2021), in which students work in groups to construct their learning using project strategies (Utami et al., 2019). The project strategy is to give students activities as a means of learning to develop attitude, knowledge, and skill competencies (Harahap & Mukhaiyar, 2020; Anggreni et al., 2019; Kuppuswamy & Mhakure, 2020; Purwanto et al., 2021; Oktarian, 2019). Students work in a real-world context, as if they were in the real world, which can produce realistic products (Sari & Angreni, 2018). In addition, the implementation of PjBL emphasizes student activity, collaboration, and exploration in the learning process, thereby encouraging the development of critical thinking and teamwork skills (Dharmayani, 2021; Prabowo et al., 2020; Dewi, 2022; Sumarni et al., 2016; Kuppuswamy & Mhakure, 2020). The learning stages in PjBL are systematically designed to build students' communication and collaboration skills in heterogeneous groups (Saenab et al, 2019).

Research in various countries, such as the United States (Thomas, 2000), Finland (Hakkarainen, 2003), and Singapore, shows that PjBL is effective in increasing student engagement and character development. In Indonesia, PjBL has also been shown to positively impact students' social skills and character (Khasanah et al., 2025). This shows that PjBL is relevant to be applied in the context of the Merdeka Curriculum to support the achievement of the Pancasila Student Profile.

Based on this description, it can be concluded that a gap remains between the demands of the Merdeka Curriculum and current learning practices in elementary schools, particularly in strengthening the Pancasila Student Profile. Therefore, this study was conducted to examine the effectiveness of the Project Based Learning (PjBL) model in improving the Pancasila Student Profile (P3) of elementary school students.

2. Method

The research design was a quasi-experimental study with a nonequivalent control group. This design was chosen because the researcher was unable to randomize subjects individually; instead, subjects were grouped by existing classes.

The sample size in this study was determined based on the number of students in two fourth-grade classes with relatively similar characteristics at SDN 017 Pandau Jaya, totalling 50 students: 25 in the experimental class and 25 in the control class. This sample size was considered adequate for educational experimental research because it allowed for statistical comparisons between groups and met the assumptions of the parametric tests used.

The sample was determined using purposive cluster random sampling, taking into account the equivalence of class characteristics, including grade level, curriculum used, number of students, and students' initial abilities based on pretest results. From several available classes, two were randomly selected as clusters that met these equivalence criteria, then designated as the experimental and control groups.

This study consisted of an experimental class that used the Project-Based Learning (PjBL) model and a control class that used expository instruction. The research design in this study is shown in Table 1.

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Table 1. Research design

R_1	O_1	X	O_2
R_2	O_3	-	O_4

Description:

R_1 : Experimental group.
R_2 : Control group.
O_1 : *Pretest for the experimental group*.
O_3 : *Pretest for the control group*.
O_2 : *Posttest for the experimental group*.
O_4 : *Posttest for the control group*.
X : The treatment for the experimental group used Project-Based Learning (PjBL).
- : The treatment for the control group used expository learning.

2.1 Experimental Procedure

The experimental procedure in this study consisted of three stages, namely the experimental preparation stage, the experimental implementation stage, and the post-experimental stage.

a. Experiment Preparation Stage

In the preparation stage, the researcher prepared learning tools, including:

1. Lesson Plan (RPP)
   Each LIP includes the subject identity, core competencies, basic competencies and indicators, learning objectives, learning materials, learning models, learning media and resources, learning steps, and assessment techniques. The RPP for the experimental class was designed using the Project-Based Learning syntax, while the RPP for the control class was compiled using the expository learning approach.
2. Teaching materials
   Teaching materials include theoretical descriptions and authentic discourse relevant to Civics Education. The teaching materials for both groups are the same in terms of content, so that differences in learning outcomes are expected to be influenced only by the learning model applied.
3. Student Worksheets (LKS)
   The student worksheets were designed as a guide for learning activities and included tasks for students to complete. In the experimental class, the LKS were designed to be project- and group-based, while in the control class, the LKS were individual and focused on reinforcing the material through practice questions.
4. Non-test instruments in the form of Pancasila Student Profile (P3) questionnaires
   The questionnaire instrument measured aspects of the Pancasila Student Profile, including cooperation, independence, creativity, and critical thinking. The questionnaire was designed as an attitude assessment scale to describe student behaviour during the learning process.

   In addition, the researchers provided classroom teachers with training on the use of the learning tools that had been developed, so that the treatment could be implemented according to the research design.

b. Experiment Implementation Stage

During the implementation stage, learning was carried out in accordance with the prepared lesson plans. The experimental class applied the Project-Based Learning (PjBL)

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model, in which students were actively involved in project planning, implementation, group work, and project results presentations.

Meanwhile, the control class implemented expository learning, characterized by direct teacher delivery of material, limited question-and-answer sessions, and individual assignments without structured project work. This difference in treatment was intended to ensure that the difference in results between the two groups was due to the learning approach used.

Before treatment, both groups were given a pretest to assess the students' initial condition in the Pancasila Learner Profile.

c. Post-Experiment Stage

After all treatments were administered, both groups were given a posttest to assess changes in students' Pancasila Student Profile following the learning process. The assessment was conducted using the same Pancasila Student Profile questionnaire as the pretest instrument, allowing for an objective comparison between conditions before and after treatment.

2.2 Data Analysis Techniques

Data analysis was performed using inferential statistics, namely the paired-samples t-test and the independent-samples *t-test*. The *paired-samples t-test was used to determine differences in pretest and posttest scores within each group, while the independent-samples t-test was used to determine differences in the increase in the Pancasila Student Profile between the experimental and control groups*. The selection of these two statistical tests was based on the research objectives, which focused on comparing averages and on testing the effectiveness of the applied learning model. Before testing the hypothesis, the data were analyzed using normality and homogeneity tests to assess normality and homogeneity as prerequisites for the statistical analysis.

3. Results

The data from the Pancasila Student Profile results for the experimental group, who were taught using the Project-Based Learning model, show that the highest score was 100 and the lowest was 78. Based on the calculations, it is known that there are 4 classes, with a class length of 9, as shown in Table 2 below:

Tabel 2. Frequency distribution of pancasila student profile data for the experimental group

class	Media (X)	Frekuensi (f)
70-78	74	1
79-87	83	13
88-96	92	8
97-105	101	3
Total		25

Next, the control group, which was taught using the expositor learning method, achieved the highest score of 80, while the lowest was 50. This data is then presented in a frequency distribution table. The calculation results show that the class interval length is 6. After determining the range, the number of classes that can be formed, and the class interval length, the data can be presented in the following grouped frequency distribution table 3.

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Tabel 3. Frequency distribution of pancasila student profile data for the control group

Class	Media (X)	Frequency (f)
50-55	52.5	2
56-61	58.5	5
62-67	64.5	10
68-73	70.5	6
74-79	76.5	1
80-85	82.5	1
total		25

Tabel 4. Results of data analysis for pancasila student profile in the experimental group and control group

Analysis Results	Experimental Group	Control Group
Mean	87.36	65.32
Varians	40.66	47.81
Standard Deviation	6.376	6.914
Minimum	78	50
Maximum	100	80

Based on Table 4, the mean (average) value of the Pancasila Student Profile data for the experimental group using the Project-Based Learning model is 87.36, with a variance of S^2 = 40.66, a standard deviation of S = 6.376, a maximum value of 100, and a minimum value of 78. Meanwhile, the mean or average improvement of the Pancasila Student Profile for the control group, which was taught using the expositor learning method, is 65.32, with a variance of S^2 = 47.81, a standard deviation of S = 6.914, a maximum value of 80, and a minimum value of 50.

The results from the Pancasila Student Profile (P3) for the experimental and control groups show a difference: the experimental group using the PjBL model achieved better results than the control group using expository learning. This difference descriptively reflects that the characteristics of PjBL learning, such as giving learning autonomy, active student involvement, and collaborative work in groups, contribute to the development of the Pancasila Student Profile dimensions, particularly cooperation, independence, creativity, and critical thinking. To clarify the difference in average Pancasila Student Profile scores between the experimental and control groups, a comparison graph is presented in Figure 1.

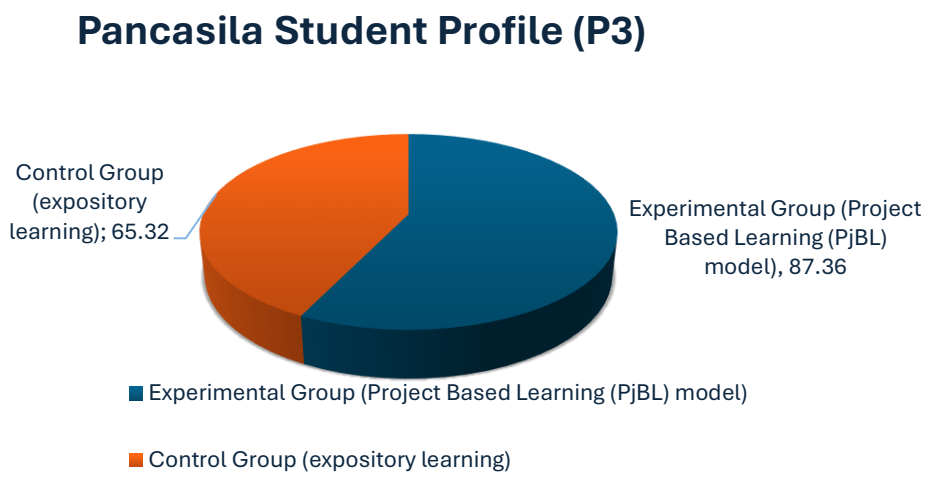


Figure 1. Comparison of the improvement in the Pancasila Student Profile between the experimental and control groups.

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Furthermore, to determine the effectiveness of the PjBL model in improving the Pancasila Student Profile (P3) for fourth-grade students at SDN 017 Pandau Jaya, this study is divided into (1) the improvement of the Pancasila Student Profile for students taught using the Project-Based Learning model and (2) the improvement of the Pancasila Student Profile for students taught using the expositor learning model. After all the data are collected, the next step is to analyze the data. The first step is to conduct a normality test to determine whether the data follow a normal distribution so that they can be used in parametric statistics. The normality test is performed using the Shapiro-Wilk test, by examining the Shapiro-Wilk value and its Asymp.Sig. The criteria for accepting normality are: if the significance value is greater than α = 0.05, the distribution is considered normal; otherwise, it is non-normal. A summary of the normality test results for the pretest and posttest data for both the control and experimental classes can be seen in Table 5 below:

Tabel 5. Test of normality

Tests of Normality

GRUP		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
PRE	Eksperimen	.136	25	.200*	.965	25	**.531**
	Control	.137	25	.200*	.964	25	**.495**
POST	Eksperimen	.116	25	.200*	.942	25	**.162**
	Control	.116	25	.200*	.980	25	**.886**

From Table 5, it can be seen that the significance value from this normality test is greater than α = 0.05. Therefore, it can be concluded that the pretest and posttest scores of students in both the control and experimental groups follow a normal distribution.

Furthermore, in this study, a homogeneity-of-variance test was conducted to assess differences between the experimental and control groups. The test used is the homogeneity test, with the criterion that if the significance value (sig) based on the mean is > 0.05, the data is homogeneous. Conversely, if the significance value (sig) based on the mean is < 0.05, the research data is considered non-homogeneous. The full calculation of the homogeneity test for the data distribution is presented in Table 6.

Tabel 6. Results of the homogeneity of variance test between the experimental and control groups

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
PRE	**Based on Mean**	2.559	1	48	**.116**
	Based on Median	2.048	1	48	.159
	Based on Median and with adjusted df	2.048	1	43.357	.160
	Based on trimmed mean	2.666	1	48	.109
POST	**Based on Mean**	.040	1	48	**.842**
	Based on Median	.028	1	48	.868
	Based on Median and with adjusted df	.028	1	45.804	.868
	Based on trimmed mean	.048	1	48	.827

Based on Table 6, the significance value (sig) for the pretest mean is 0.116, which is greater than 0.05; thus, the data are homogeneous. Next, the significance value (sig) for the posttest mean is 0.842; since 0.842 > 0.05, it can also be concluded that the data are homogeneous.

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After confirming that the data follows a normal distribution and is homogeneous, a parametric statistical test, the paired t-test, was conducted to determine whether the model used in the control and experimental classes was effective in improving the Pancasila Student Profile. The decision rule for the paired sample t-test is that if the Sig. (2-tailed) If the value is < alpha (0.05), the Project-Based Learning model used can improve students' Pancasila Student Profiles. The results of the paired t-test can be seen in Table 7 below:

Tabel 7. Results of the paired t-test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Eksperi-men	PRE - POST	-28.68000	11.20536	2.24107	-33.30534	-24.05466	-12.797	24	**.000**
Control	PRE - POST	-9.96000	5.61605	1.12321	-12.27819	-7.64181	-8.867	24	**.000**

Based on Table 7, a Sig. (2-tailed) value of 0.000 (< 0.05) was obtained for both the experimental and control groups. This indicates that both learning models are statistically capable of improving students' Pancasila Student Profile. However, the difference between the pretest and posttest mean scores in the experimental group (-28.68) was much greater than that in the control group (-9.96), indicating that the improvement in the experimental group was more substantial.

The next stage was to test the hypothesis using an *independent-samples t-test to determine whether the means differed between the two classes and identify which class was more effective:* the control or the experimental class. The *independent sample t-test* analysis is presented in Table 8.

Tabel 8. Results of the independent sample test hypothesis

		Levene's Test		t-test for Equality of Means						
						Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		F	Sig.	t	df				Lower	Upper
DIF	Equal variances assumed	18.017	.000	7.468	48	**.000**	18.72000	2.50679	13.67976	23.76024
	Equal variances not assumed			7.468	35.342	.000	18.72000	2.50679	13.63270	23.80730

Based on Table 8, a Sig. (2-tailed) A value of 0.000 (< 0.05) was obtained, indicating a significant difference in the increase in the Pancasila Student Profile between the experimental and control groups. The *mean difference* of 18.72 indicates that students who participated in PjBL

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learning had a much larger increase in the Pancasila Student Profile than those who participated in expository learning.

Pedagogically, these results show that the main elements of PjBL, such as learning autonomy, group collaboration, and active student involvement in solving real problems, play an important role in internalizing Pancasila values in student learning behaviour. Thus, it can be concluded that the *Project Based Learning* model has a significant and meaningful effect on improving students' Pancasila Student Profile.

4. Discussion

The Pancasila Student Profile encompasses various dimensions of character and 21st-century competencies that require students' active involvement in the learning process. All of these dimensions are closely related to the characteristics and syntax of the Project-Based Learning (PjBL) model, making PjBL more relevant than conventional learning methods for developing the Pancasila Student Profile. PjBL places students as active subjects of learning through authentic, collaborative, and problem-solving-oriented learning experiences. The advantages of PjBL over expository learning can be explained through the theory of social constructivism (Huang, 2021; Chand, 2023; Jemberie, 2021), which emphasizes that learning is most effective when students construct knowledge through social interaction and meaningful activities.

In PjBL, students not only receive information from teachers but are also directly involved in the processes of exploration, discussion, and reflection, which allow for the simultaneous development of conceptual understanding and character values. The findings of this study align with research on PjBL (Steffen et al., 2022; Lobczowski et al., 2021; Miller et al., 2025; Mohedo & Bujez, 2014), which shows that PjBL can increase student engagement, learning motivation, and responsibility for the learning process and its outcomes. Through open, contextual projects, students are given autonomy to plan, implement, and evaluate their own learning activities, thereby strengthening the values of independence and creativity as part of the Pancasila Student Profile.

In addition, the collaborative aspect of PjBL is an important factor that explains why this model is more effective than conventional learning. Research Zhong et al (2024) confirms that collaborative learning in PjBL encourages the development of social, communication, and teamwork skills. These values align directly with the dimensions of cooperation and global diversity in the Pancasila Student Profile.

The results of this study are also supported by international studies (Ricaurte & Viloria, 2020; Eliyasni et al., 2019), which indicate that PjBL is effective in developing higher-order thinking skills by training students to analyse problems, integrate cross-disciplinary knowledge, and produce applicable solutions. In this context, PjBL not only improves cognitive learning outcomes but also shapes students' character and social competencies.

However, this study has several limitations that warrant critical examination. First, the relatively small sample size and the involvement of only one elementary school limit the generalization of the research results. Second, the relatively short duration of PjBL implementation does not fully describe the long-term impact on strengthening the Pancasila Student Profile. Third, the school's specific social and cultural context may introduce external factors that may influence the research results. Recognition of these limitations is important to maintain the validity and credibility of the research findings.

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Despite its limitations, this study has significant practical implications for the world of education, namely that teachers should integrate PjBL continuously with contextual project planning, oriented towards real problems, and providing space for student reflection. In addition, school policy support, professional teacher training, and adequate learning resources are key factors in expanding the implementation of PjBL in Indonesian schools. Thus, PjBL has the potential to become a strategic approach to supporting the implementation of the Merdeka Curriculum and to systematically and sustainably strengthen the Pancasila Student Profile.

5. Conclusion and implications

This study concludes that Project-Based Learning (PjBL) is proven to be more effective than conventional learning in improving the Pancasila Student Profile of elementary school students. The application of PjBL encourages active student involvement through collaborative activities, problem-solving, and independent decision-making, thereby strengthening the values, attitudes, and competencies aligned with the dimensions of the Pancasila Student Profile. These findings have important implications for the development of the Merdeka Curriculum, particularly in strengthening the implementation of the Pancasila Student Profile Strengthening Project (P5). PjBL can be used as a strategic approach to create meaningful, contextually relevant, and character-oriented learning, making it a strong basis for strengthening learning policies in elementary schools. Future research is recommended to conduct longitudinal studies to examine the long-term impact of PjBL implementation on the development of students' Pancasila Student Profile. In addition, research needs to be conducted across a broader range of school and regional contexts in Indonesia to strengthen the generalizability of findings and examine the adaptation of PjBL to local characteristics and school culture.

Credit authorship contribution statement

The first author was responsible for conceptualization, data collection, and writing the original draft. The second author contributed to the design of the methodology and to the review and editing of the manuscript. The third author conducted the literature review.

Declaration of competing interest

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Ethical Declaration

This research was conducted in accordance with ethical principles, without plagiarism, with the consent of all relevant parties, and in a manner that ensures the authenticity of the data. The authors declare that there are no conflicts of interest.

Statement of Transfer of Responsibility

The preparer/editor did not received the necessary data or information required to complete and verify the following sections: data availability statement, acknowledgements, and AI disclosure statement. Accordingly, full academic and legal responsibility for the content and accuracy of these statements is hereby transferred to the authors, including any consequences arising from non-compliance with the target journal's policies and applicable ethical standards.

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