

Research Article

Effect of Problem Solving and Numbered Heads Together Models on Cooperation Character and Critical Thinking of Fourth Graders in Pancasila Profile

Rhisma Dwi Zuliana ^{1*}, Devita Sulistiana ², Sripit Widiastuti ³
^{1,3} Elementary School Teacher Education Study Program, Faculty of Teacher Training and Education, Universitas Islam Balitar,, Indonesia

² Biology Education Study Program, Faculty of Teacher Training and Education, Universitas Islam Balitar,, Indonesia

*Correspondence: dwizuliana216@gmail.com

Abstract: This study aims to determine the effect of the combined learning model of Problem Solving with Numbered Head Together (NHT) on the character of mutual cooperation and critical reasoning abilities of fourth-grade students of SD Negeri Kanigoro 03. This type of research uses a quantitative approach with a Posttest Only Non-Equivalent Control Group Design. The research subjects consisted of two classes, namely class IV A as the experimental group and class IV B as the control group, each consisting of 23 students. The research instruments included an observation sheet of mutual cooperation character and a critical reasoning ability test. Data analysis was carried out through normality, homogeneity, and t-test using SPSS with a significance level of 5%. The results showed that the data were normally distributed and homogeneous. The t-test produced a calculated t value of $2.940 > t$ table 2.015 with a significance of 0.019 for the character of mutual cooperation and a calculated t value of $2.343 > t$ table 2.015 with a significance of 0.024 for critical reasoning abilities. These results demonstrate that the combined Problem Solving and NHT models significantly enhance students' mutual cooperation and critical reasoning skills. Therefore, implementing this model effectively develops students' cognitive competencies and character, aligned with the Pancasila student profile.

Keywords: Critical Reasoning; Mutual Cooperation; Numbered Heads Together (NHT); Pancasila Student Profile; Problem Solving

1. INTRODUCTION

The Indonesian education system has undergone significant changes due to the COVID-19 pandemic, which has required rapid adaptation in various aspects, including education. The Ministry of Education and Culture (Kemendikbud) responded to this situation by issuing Circular Letter Number 4 of 2020 to reduce the risk of virus spread (Kemendikbud, 2020). However, many educators have encountered obstacles in completing the curriculum, making it difficult for students to understand the learning material. This situation has caused some students to feel unable to follow lessons and wait until the situation returns to normal. Research by Jatira (2021) revealed that online learning during the pandemic caused stress, boredom, and laziness among students. In response, the Ministry of Education and Culture issued Decree Number 719 of 2020 concerning the special conditions curriculum to ease the learning burden by providing educational units with flexibility in choosing an appropriate curriculum—national, emergency, or simplified version.

As a form of continuous evaluation, the government has designed education policies that take into account student characteristics during the pandemic. As a result, Minister of Education Nadiem Makarim introduced a new policy, the Independent Curriculum, as an extension of the 2013 Curriculum. The primary objective of this curriculum is to strengthen character and enhance competencies in line with the Pancasila student profile (Ismail and Bay, 2024). The six main indicators of the Pancasila student profile include faith and piety, noble character, global diversity, mutual cooperation,

Received: September 2, 2025

Revised: September 16, 2025

Accepted: September 30, 2025

Published: October 14, 2025

Curr. Ver.: October 17, 2025



Hak cipta: © 2025 oleh penulis.

Diserahkan untuk kemungkinan publikasi akses terbuka

berdasarkan syarat dan ketentuan

lisensi Creative Commons

Attribution (CC BY SA) (

<https://creativecommons.org/licenses/by-sa/4.0/>)

independence, and critical and creative reasoning (Kemendikbudristek, 2022). One important characteristic is mutual cooperation, which reflects the values of togetherness and cooperation in achieving common goals (Jayanti, 2024). Unfortunately, this value is beginning to fade due to technological advances and individualistic lifestyles, even though mutual cooperation has been proven to strengthen social relationships and positive emotional control (Kostelnik, M. J. 2012).

In addition to mutual cooperation, critical reasoning skills are also a key aspect of the Pancasila student profile. This ability is crucial for students to analyze problems and find rational solutions. Azizah, M., Sulianto, J., & Cintang (2018) emphasized that critical reasoning encompasses the ability to differentiate problems, analyze information, and design problem-solving strategies. In a learning context, its effectiveness is greatly influenced by internal factors such as student motivation and abilities, as well as external factors such as the learning model used (Joyce, B., & Weil, 2000).

Learning models play a significant role in enhancing student understanding. One effective model is problem-solving, an approach that requires students to find the best solution from various alternatives (Ummaha et al., 2022). Redhana IW (2013) emphasized that this method is not just a teaching strategy but also a way of thinking that fosters problem-solving skills. Based on Vygotsky's theory, group learning is more effective because it allows peer tutors to help each other (Monalistyani et al., 2024). Therefore, the problem-solving model can be combined with cooperative learning such as Numbered Heads Together (NHT).

Cooperative learning, according to Anita Lie (2002), is a learning activity in which students work together in groups to complete structured tasks. Suprijono (2009) emphasized that this learning encompasses all forms of teacher-facilitated group work. The NHT model itself emphasizes small group discussions with assigned member numbers (Fatimah and Syamsudin, 2021; Dwi Pamungkas, 2021). Its advantages include increasing student preparedness and encouraging active interaction between members (Susanto, 2012).

Research shows that the combination of problem-solving and NHT can improve learning outcomes (Rahmaliana and Mahmuddin, 2023) and critical reasoning skills (Yulia and Wijaya, 2013). This model has also been shown to foster student character (Noorhidayati, Nisa, and Hardiansyah, 2018). Observations in fourth grade showed that conventional learning still dominates, and students' critical reasoning skills are relatively low. Therefore, the research entitled "The Effect of the Problem-Solving and Numbered Heads Together (NHT) Learning Model on the Gotong Royong Character and Critical Reasoning Skills of Fourth Grade Students as a Manifestation of the Pancasila Student Profile" is important to conduct. The combination of the two models is expected to develop students' critical thinking and collaboration skills in solving problems collectively.

2. RESEARCH METHODS

This study uses a quantitative approach with a quasi-experimental type that aims to determine the effect of treatment on other variables under controlled conditions (Sugiyono, 2016). The research design used is *Posttest Only Non-Equivalent Control Group Design*, consisting of two groups, namely the experimental group that received the *Problem Solving learning model treatment with Numbered Heads Together (NHT)* and the control group with conventional methods. The study was conducted at SD Negeri Kanigoro 03 on May 15, 2025 because the location is easy to reach, the school is open to research collaboration, and participant data is according to research needs. The study population includes all fourth-grade students of SD Negeri Kanigoro 03, totaling 46 students, with class IV A as the experimental group and class IV B as the control group, each consisting of 23 students. The sampling technique used total sampling, where the entire population was used as a research sample (Sugiyono, 2016).

According to Sugiyono (2016), research variables are attributes that have certain variations and are studied to draw conclusions. In this study, the independent variable is a combination of *the Problem Solving and Numbered Heads Together models*, while the dependent variables include the character of mutual cooperation and critical reasoning skills, with control variables in the form of teaching modules, media, evaluation, teaching staff, and measurement instruments. *The Problem Solving* and NHT models aim to develop students' problem-solving and social cooperation skills. The character of mutual cooperation includes the values of collaboration, caring, and sharing (BKSP, 2022), while critical

reasoning skills are defined as the ability to analyze, evaluate, and solve problems through three main indicators: obtaining information, analyzing, and reflecting on the results of thinking (BKSP No. 09, 2022).

The research instruments consisted of learning implementation observation sheets, mutual cooperation character observation sheets, and critical reasoning ability tests that included multiple choice questions and essays. Validity tests were conducted using Arikunto's Product Moment technique (2002) to determine the extent to which the instrument was able to measure the intended variables, while reliability tests used Cronbach Alpha (Ustman, 2006) to test the consistency of measurement results. The research procedure followed the steps of Emzir (2010), including problem formulation, subject and instrument selection, design determination, data collection, analysis, and conclusion drawing. Data analysis was carried out quantitatively with several stages, namely the normality test using the Lilliefors test to ensure normal data distribution, the homogeneity test using the Levene test to determine the similarity of variances between groups, and the hypothesis test using the t-test to compare the posttest results between the experimental and control groups at a significance level of 5%. Data processing was carried out using SPSS, with the decision criteria that $t \text{ count} \geq t \text{ table}$ means H_a is accepted and $t \text{ count} < t \text{ table}$ means H_a is rejected.

3. RESULTS AND DISCUSSION

Numbered Heads Together (NHT) Learning Model on the Character of Mutual Cooperation and Critical Reasoning Ability

Based on the results of the learning implementation sheet with a combination of *Problem Solving* and *Numbered Heads Together (NHT)* on the character of mutual cooperation and critical reasoning skills, the results showed that all stages had been implemented according to the learning procedures. The learning process was carried out through three main stages, namely the initial, core, and closing stages. The study began with measuring students' initial abilities before the treatment was given, continued with the application of the *Problem Solving* and *NHT combined learning model* in the experimental class, and ended with the implementation of a post-test to assess the impact of the treatment on students' understanding of the material "Forces Around Us."

Data collection methods included observation sheets and post-tests to measure student understanding before and after the treatment, as well as assessing the character of mutual cooperation and critical reasoning skills. Additionally, a learning implementation *checklist* was used to ensure the validity of the model's application and student engagement during the learning process. The implementation results of the combined *Problem Solving* and *NHT models* can be seen in Table 1 below.

Table 1 Implementation of *the Problem Solving* and *Numbered Heads Together (NHT)* Learning Model.

No	Aspect	Percentage of Achievement	
		Meeting I	Meeting II
1	Early stage	30.4 % .	30.4 % .
2	Core Stage	39.1 % .	39.1 % .
3	Closing Stage	30.4 % .	30.4 % .
Total Achievement Percentage		100%	100%

The results in Table 4.1 show that the learning implementation reached 100% across all indicators, indicating that the combined *Problem Solving* and *NHT model* was implemented very well in each meeting. The initial stage obtained a percentage of 30.4% which focused on student learning habits and readiness, the core stage of 39.1% which emphasized active student participation in discussion, investigation, and presentation activities, and the closing stage of 30.4% which included reflection activities, conclusions, and follow-up learning. Overall, these results show that the implementation of the combined *Problem Solving* and *NHT model* was able to optimize the role of the teacher as a facilitator while increasing active student involvement.



Figure 1 Implementation of *the Problem Solving* and *Numbered Heads Together* (NHT) Learning Model.

Meanwhile, conventional learning was implemented in the control class (class IV B) for two meetings without using a combination of *the Problem Solving* and *NHT models*. The implementation of conventional learning is shown in Table 2 below.

Table 2 Implementation of Conventional Learning in the Control Class.

No	Aspect	Percentage of Achievement	
		Meeting I	Meeting II
1	Early stage	30.4 % .	30.4 % .
2	Core Stage	30.4 % .	30.4 % .
3	Closing Stage	30.4 % .	30.4 % .
Total Achievement Percentage		100%	91.2%

Based on Table 2, the implementation of conventional learning reached 91.2%, with 21 indicators implemented and 2 indicators not implemented, namely the teacher did not show learning videos. The initial stage obtained a percentage of 30.4%, which emphasized student discipline and readiness to learn, the core stage of 30.4% with discussion activities, questions and answers, experiments, and assignments, although without video screenings, and the closing stage of 30.4% which included conclusion activities, reflection, and prayer together. Thus, the implementation of conventional learning in the control class remained quite effective despite some technical obstacles in the core stage.



Figure 2 Implementation of the Conventional Learning Model.

Post-Test Assessment of Mutual Cooperation Character in Experimental and Control Classes

The results of observations regarding the character of mutual cooperation of fourth-grade students at Kanigoro State Elementary School showed a difference between the experimental group (grade IV A) which used a learning model combining Problem Solving with *Numbered Head Together* (NHT) and the control group (grade IV B) which used a conventional learning model. The data from the observations are presented in Table 3 below.

Table 3. Observation Value Data of Mutual Cooperation Character in Experimental Class and Control Class.

IV A (Experimental Class)			IV B (Control Class)	
No	Name	Mark	Name	Mark
1	ABF	72	AAS	71
2	ARN	80	AWA	73
3	APW	73	AMI	71
4	FIG	85	WHAT	75
5	APVH	75	ASPYS	80
6	BKH	85	AKA	74
7	BASS	79	THERE IS	67
8	BAAS	90	BAEA	81
9	CAQS	76	BR	75
10	DPF	89	BCRA	71
11	DAA	73	C	80
12	BI	73	DMS	75
13	DW	72	DNS	89
14	FCP	90	FNA	80
15	FCC	73	JKA	73
16	GANF	76	KMW	74
17	ICPS	76	MO	82
18	IAG	72	MSZ	72
19	JKO	89	MDFP	71
20	MARB	82	MKA	67
21	MNFR	76	NSA	74
22	MNAP	70	NZS	71
23	MRDP	71	RNAP	72
Class Average		78	Class Average	75

Based on Table 3, it is known that the average value of the mutual cooperation character of students in the experimental class was 78, while the control class was 75. This difference indicates that the application of the combined Problem Solving and NHT model has a positive influence on improving the mutual cooperation character of students. This is evident from the increase in cooperation, active participation, and students' ability to interact and share responsibilities during the learning process. Thus, collaborative-based learning through the Problem Solving and NHT approaches has proven to be more effective than conventional learning in forming the mutual cooperation character.

Next, the results of the critical reasoning ability assessment were obtained through a post-test, which aimed to measure students' critical thinking skills regarding the material taught. This test was administered to two groups: an experimental class using the Problem-Solving and NHT models and a control class using conventional learning. The critical reasoning ability test results are presented in Table 4.4 below.

Table 4 Critical Reasoning Ability Test Score Data for Experimental and Control Classes

IV A (Experimental Class)			IV B (Control Class)	
No	Name	Mark	Name	Mark
1	ABF	72	AAS	60
2	ARN	71	AWA	71
3	APW	68	AMI	87
4	FIG	85	WHAT	80
5	APVH	65	ASPYS	71
6	BKH	72	AKA	60
7	BASS	86	THERE IS	64
8	BAAS	80	BAEA	71
9	CAQS	60	BR	72
10	DPF	82	BCRA	58

IV A (Experimental Class)			IV B (Control Class)	
No	Name	Mark	Name	Mark
11	DAA	68	C	71
12	BI	74	DMS	66
13	DW	85	DNS	80
14	FCP	86	FNA	79
15	FCC	60	JKA	65
16	GANF	75	KMW	71
17	ICPS	68	MO	80
18	IAG	72	MSZ	60
19	JKO	89	MDFP	56
20	MARB	72	MKA	61
21	MNFR	72	NSA	44
22	MNAP	71	NZS	67
23	MRDP	65	RNAP	58
Class Average		74	Class Average	67

Based on Table 4, the average critical reasoning ability score for the experimental class was 74, while the control class was 67. These results indicate that students who participated in learning with the combined Problem Solving and NHT models had better critical reasoning abilities than students who learned with the conventional method. This improvement reflects the effectiveness of the combined model in developing analytical thinking skills, problem solving, and logical reflection during the learning process.

Normality Test

A normality test was conducted using the Kolmogorov-Smirnov method to determine whether the research data was normally distributed. The test results are presented in Table 5 below.

Table 5 Results of the Normality of Mutual Cooperation Characters.

Tests of Normality						
Kolmogorov-Smirnov ^a			Shapiro-Wilk			
	Statistics	df	Sig.	Statistics	df	Sig.
Mutual Cooperation_KE	.233	23.220	.864	.23	0.96	
Mutual Cooperation_KK	.216	23.069	.907	.23	.055	

a. Lilliefors Significance Correction

a. Lilliefors Significance Correction

Based on the results in Table 5, the significance value of the mutual cooperation character of the experimental class with the combined learning model of Problem Solving and *Numbered Head Together* is 0.220, while the control class with conventional learning is 0.069. Both values are greater than the significance level of 0.05, so it can be concluded that the mutual cooperation character data is normally distributed.

Furthermore, the results of the normality test on students' critical reasoning abilities are presented in Table 6 below.

Table 6 Results of Normality of Critical Thinking Ability.

Tests of Normality						
Kolmogorov-Smirnov ^a			Shapiro-Wilk Statisti			
	Statistics	df	Sig.	cs	Df	Sig.
Critical Thinking_KE	.195	23	.239	.933	23	.128
Critical Thinking_KK	.117	23	.200	.966	23	.589

. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 6 shows that the significance value of critical reasoning ability for the experimental class was 0.239 and for the control class was 0.200. Since both values are greater than 0.05, the critical reasoning ability data are also normally distributed. Thus, all data on both the mutual cooperation character and critical reasoning ability variables meet the normality assumption required for further statistical analysis.

Homogeneity Test

A homogeneity test is performed to determine whether the variances between two data groups are similar. The results of this test are presented in Table 7 below.

Table 7 Results of the Homogeneity of Mutual Cooperation Characters.

		Test of Homogeneity of Variances			
		Levene Statistics	df1	df2	Sig.
Critical thinking	Based on Mean	3,517	1	44	.067
	Based on Median	1,577	1	44	.216
	Based on Median and with adjusted df	1,577	1	41,509	.216
	Based on trimmed mean	3,406	1	44	.072

Based on the results in Table 7, the mutual cooperation character between the experimental class using the *Problem Solving* and *Numbered Head Together learning model* and the control class with conventional learning has a significance value of 0.072. This value is greater than the significance level of 0.05, so it can be concluded that the mutual cooperation character data is homogeneous or has the same variance.

Next, the results of the homogeneity test for critical reasoning ability are shown in Table 8 below.

Table 8 Results of Homogeneity of Critical Thinking Skills.

		Test of Homogeneity of Variances			
		Levene Statistics	df1	df2	Sig.
Critical thinking	Based on Mean	.537	1	44	.468
	Based on Median	.810	1	44	.373
	Based on Median and with adjusted df	.810	1	43,974	.373
	Based on trimmed mean	.555	1	44	.460

The results in Table 8 yield a significance value of 0.460, which is also greater than 0.05. Thus, the critical reasoning skills of the experimental and control classes can be said to be homogeneous. This result indicates that the variances of both groups are equal, thus meeting the basic assumptions for further statistical analysis.

Hypothesis Testing

Hypothesis testing in this study was conducted using the t-test (Independent Sample t-Test) with the help of the SPSS program, aimed at determining significant differences between the post-test results of the experimental group and the control group. The test was conducted at a significance level of 5% (0.05), with two main hypotheses: (1) the effect of the learning model combining Problem Solving with *Numbered Head Together* (NHT) on the character of mutual cooperation, and (2) the effect of the learning model on critical reasoning abilities.

Table 9 Results of the Mutual Cooperation Character Hypothesis.

		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	Standard Error Difference	Lower Upper
Mutual cooperation	Equal variances assumed	.517	.674	2,940	44	.019	8.43478	3.77013	.73268 13.00224
	Equal variances not assumed			2,940	43,321	.019	8.43478	3.77013	.73922 13.00879

Based on the results in Table 9, the t-test shows a calculated t-value of 2.940, which is greater than the t-table of 2.015, with a significance value of $0.019 < 0.05$. This result means that H_0 is rejected and H_a is accepted, so there is a significant difference between the experimental group and the control group. Thus, the combined learning model of Problem Solving and *Numbered Head Together* (NHT) has an effect on improving students' mutual cooperation character. This shows that the application of collaborative and problem-solving-based models can foster a spirit of cooperation and active participation in the learning process.

Next, the results of the hypothesis test on critical reasoning abilities are presented in Table 10 below.

Table 10 Results of the Critical Thinking Ability Hypothesis.

		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	Standard Error Difference	Lower Upper
Critical thinking	Equal variances assumed	.537	.468	2,343	44	.024	6.34783	2.70961	.88697 11.80869
	Equal variances not assumed			2,343	42,865	.024	6.34783	3.70961	.88288 11.81277

From the results of Table 10, the calculated t value is $2.343 > t$ table 2.015 with a significance of $0.024 < 0.05$, so that H_0 is rejected and H_a is accepted. This means that there is a significant difference between students' critical reasoning abilities in the experimental class and the control class. The learning model combining Problem Solving with *Numbered Head Together* (NHT) has been proven to be able to improve students' critical thinking abilities because it provides wider opportunities for discussion, formulating arguments, and testing solutions through group interactions.

Discussion

the Problem Solving and Numbered Heads Together (NHT) Learning Model on the Character of Mutual Cooperation

Science learning, particularly the topic of forces around us, is closely related to everyday life. However, the use of conventional learning models often makes it difficult for students to apply these concepts in real life. Therefore, engaging and interactive learning models are needed to motivate and actively engage students in the learning process. According to Erita (2017), *the Numbered Heads Together* (NHT) model is effective in encouraging students to share opinions and discuss solutions together. Similarly, Odja (2010) stated that NHT provides opportunities for students to exchange ideas and consider the best answers through group work.

The NHT model has many advantages, as explained by Kusnaeni (2023), including fostering learning readiness, fostering active discussions, developing peer tutors, increasing self-confidence, and strengthening the character of mutual cooperation. According to Putriasih (2020), this character is a selfless act of working together for the common good. Similarly, Emalasari and Wulandari (2022) emphasized that mutual cooperation encompasses elements of positive interdependence, responsibility, personal interaction, cooperation, and evaluation. The results showed that students in the experimental class had better mutual cooperation than those in the control class, because these elements were implemented through collaborative learning.

In addition to improving cooperation, cooperative learning also has a positive impact on academic achievement. Maryoto (2016) stated that the experimental class with cooperative learning showed higher academic results than the control class. A positive and collaborative learning environment makes students more enthusiastic in learning. One effective variation of cooperative learning is NHT, where students are more aware of material that is not yet understood and are encouraged to ask questions or discuss it. This supports the findings of Widhy Hastuti, Widowati, and Setyowarno (2018) that the Problem Solving model helps students focus on problem solving and strengthens thinking skills. Similarly, Katuuk, Sumarauw, and Pulukadang (2024) explain that Problem Solving guides students to connect their knowledge to solve real-world problems systematically.

According to Suharti (2020), the advantage of *Problem Solving* lies in its relevance to real life, because through the problem-solving process, students become more skilled, creative, and accustomed to critical thinking. In this study, two classes were used as samples: an experimental class that implemented a combination of *Problem Solving* and NHT, and a control class that used conventional learning. In the experimental class, learning took place in three stages: the initial stage (opening activities and student conditioning), the core stage (problem solving and group discussion), and the closing stage (reflection, conclusions, and assessment). All stages were implemented according to plan and ran effectively.

Meanwhile, conventional learning only focuses on lectures, assignments, and simple discussions, so it tends to be monotonous and does not foster a spirit of mutual cooperation. The results of the post-test score comparison show that students in the experimental class have a higher average score for the character of mutual cooperation than the control class. Thus, the combined model of *Problem Solving* and NHT is proven to have a significant effect on strengthening students' character of mutual cooperation. This result is supported by the hypothesis test with a calculated t value = 2.940 > t table = 2.015 and a significance of $0.019 < 0.05$, which means the first hypothesis is accepted. This study is in line with the findings of Indri (2017) that the combined application of Problem Solving and NHT improves student learning outcomes through heterogeneous group work. In addition, Kurniastuti, RN, Nuswantari, N., & Feriandi (2022) emphasized that this approach also helps shape students' character according to the values of Pancasila in national and state life.

the Problem Solving and Numbered Heads Together (NHT) Learning Model on Critical Reasoning Skills

Science learning, particularly on the topic of force and magnetism, demands critical reasoning skills so that students can understand and apply these concepts in everyday life. If the learning model applied is uninteresting and inappropriate, students' critical reasoning skills will struggle to develop. Therefore, an effective learning model is needed to foster these skills. According to Ernawati and Rahmawati (2022), critical reasoning skills in the Pancasila student profile include the ability to obtain and process information, analyze and evaluate reasoning, and reflect on one's own thoughts.

Meanwhile, Azizah (2018) emphasized that critical reasoning involves the skills of asking questions, planning strategies, and evaluating decisions. Based on this, students in the experimental class who demonstrated better critical thinking skills than the control class likely had mastered these skills more thoroughly.

In BKSP No. 09, critical reasoning indicators include the ability to obtain and process information, analyze, evaluate, and reflect on thoughts. However, many students still struggle because they lack the courage to ask questions and are not accustomed to analyzing or reflecting on the results of their thinking. According to Dadri, Dantes, and Gunamantha (2019), the use of the *Numbered Heads Together* (NHT) model can improve critical thinking skills because this model is innovative and fun, so students feel more comfortable in the learning process. In line with that, Wati and Fatimah (2016) emphasized that the NHT type of cooperative learning model is effective in improving students' critical thinking processes.

Meanwhile, according to Hartini (2017), the Problem Solving approach is an effective pedagogical strategy for optimizing critical reasoning skills because it encourages students to identify problems, formulate truths, and draw conclusions through group discussions. This is reinforced by Syarif (2016) who explains that Problem Solving requires students to process information systematically to produce appropriate actions, which is closely related to critical thinking skills.

This study used two classes as samples: an experimental class that implemented a combination of the Problem Solving and NHT models, and a control class that used conventional methods. The learning process in the experimental class took place in three stages: the initial stage (introduction and student conditioning), the core stage (problem solving, group discussions, and presentations), and the closing stage (reflection and conclusions). All stages were effective and involved active student participation.

In contrast, conventional learning tends to be monotonous because it only focuses on lectures, assignments, and simple questions and answers. This makes students less interested and not encouraged to develop critical thinking skills. Based on the post-test results, the experimental class showed a higher average value of critical reasoning skills than the control class. This proves that the combination of *Problem Solving* and NHT has a significant effect on improving students' critical reasoning skills, with a calculated t value of $2.343 > t$ table 2.015 and a significance of $0.024 < 0.05$.

This result is in line with Achmad's research (2018) which shows that the application of the Problem Solving model combined with NHT significantly improves students' cognitive, affective, and psychomotor learning outcomes. Additional support also comes from Cahyani, Irianto, and Furnamasari (2025) who found that the NHT type of cooperative model was able to improve the mutual cooperation character of students in the experimental class, indicating that this type of collaborative learning is effective in developing students' intellectual abilities as well as social character.

4. CONCLUSION

The results of the study indicate that the application of a learning model combining Problem Solving with *Numbered Heads Together* (NHT) significantly improved students' mutual cooperation and critical reasoning skills. The experimental class achieved higher average scores than the control class in both aspects. These findings indicate that the combination of problem-solving and group work-based learning models is effective in improving critical thinking skills while strengthening the value of mutual cooperation in elementary school students. Therefore, this model can be implemented as an alternative learning strategy relevant to realizing the profile of Pancasila students who are collaborative, critical, and have character.

BIBLIOGRAPHY

- Achmad, AA (2018) 'Improving Students' Critical Thinking Skills Using the Numbered Heads Together Cooperative Learning Model Based on Problem Solving', *Jurnal Pendidikan Surya Edukasi (JPSE)*, (2), p. 4.
- Arikunto, S. (2002) *Research Procedures: A Practical Approach*. Jakarta: Rineka Cipta.
- Azizah, M., Sulianto, J., & Cintang, N. (2018) 'Analysis of elementary school students' critical thinking skills in mathematics learning using the 2013 curriculum. *Journal of educational research*, 35(1), 61-70.'
- Cahyani, SA, Irianto, DM and Furnamasari, YF (2025) 'The Effect of Implementing the Numbered Heads Together Cooperative Learning Model to Improve the Character of Mutual Cooperation', *Indo-MathEdu Intellectuals Journal*, 6(1), pp. 52–65. Available at: <https://doi.org/10.54373/imeij.v6i1.2258>.

- Dwi Pamungkas, M., Rahmawati, F. and Apriliyani, MN (2021) 'Analysis of Dynamic Thinking Process in Solving Analytical Geometry Problems of Space', *Didactical Mathematics* , 3(2), pp. 59–67. Available at: <https://doi.org/10.31949/dm.v3i2.1628>.
- Emalasari, NPA and Wulandari, IGAA (2022) 'Implementation of Tri Hita Karana Habits to Improve Mutual Cooperation Character Education of Elementary School Students', *Scientific Journal of Batanghari Jambi University* , 22(3), p. 1560. Available at: <https://doi.org/10.33087/jiubj.v22i3.2578>.
- Erita (2017) 'The Influence of Numbered Head Together (NHT) Type Cooperative Learning Strategy and Learning Interest on Accounting Learning Outcomes of Class XII Students of Nusatama Vocational School, Padang Erita', *ECONOMICA Journal of Economic and Economic Education* , 6(1), pp. 72–86.
- Fatimah, S. and Syamsudin, S. (2021) 'Numbered Head Together (NHT) Learning Model in Improving Thematic Learning Outcomes of Elementary Madrasah Students', *Awaliyah: Jurnal PGMI* , 4, pp. 38–54.
- Indri (2017) 'Efforts to improve science learning outcomes of fifth grade students using the Problem Solving model combined with the Numbered Heads Together (NHT) method (Thesis, Satya Wacana Christian University). Satya Wacana Christian University Institutional Repository'.
- Ismail, M. and Bay, RR (2024) 'Analysis of the Cultivation of Pancasila Student Profile Values To Build Student Character in Ypk Ermasu Merauke Elementary School', *Jurnal Eduscience* , 11(1), pp. 149–162. Available at: <https://doi.org/10.36987/jes.v11i1.5659>.
- Jatira, Y. and S, N. (2021) 'The Phenomenon of Stress and the Habit of Online Learning during the Covid-19 Pandemic', *Edukatif: Journal of Educational Sciences* , 3(1), pp. 35–43. Available at: <https://doi.org/10.31004/edukatif.v3i1.187>.
- Jayanti, T., Istiqomah, L. and Kurniawan, I. (2024) 'Implementation of the Mutual Cooperation Character in Subjects', *Journal of Elementary School Education* , 8(2), pp. 1–3.
- Joyce, B., & Weil, M. (2000) *Models of Teaching* (6th ed.; contribution by Emily Calhoun). Pearson Education. (ISBN, edition, etc. as printed) .
- Katuuk, RC, Sumarauw, SJA and PuluANGKA, RJ (2024) 'Problem-Solving Abilities Based on Polya Steps: A Study of Remboken 1 Public Middle School Students', *Journal of Education Research* , 5(1), pp. 180–188.
- Ministry of Education, Culture, Research, and Technology (2022) 'Dimensions, Elements, and Sub-Elements of the Pancasila Student Profile in the Independent Curriculum', pp. 1–37.
- Kostelnik, MJ, Gregory, KM, Soderman, AK, & Whiren, AP (2012) *Guiding Children's Social Development and Learning*. In M. Kerr (Ed.), Cengage Learning (7th ed.). Wadsworth Cengage Learning .
- Kurniastuti, RN, Nuswantari, N., & Feriandi, YA (2022) 'Implementation of the Pancasila student profile as a form of character education for junior high school students. In National Seminar on Social, Science, Education, Humanities (Senassdra) (Vol. 1, No. 1, pp. 287–293).', *National Seminar ...* , 1, pp. 287–293.
- Kusnaeni, D., Affandi, LH and Oktaviyanti, I. (2023) 'Numbered Head Together Learning Model to Improve Elementary School Students' Learning Outcomes', *Jurnal Educatio FKIP UNMA* , 9(2), pp. 1017–1023. Available at: <https://doi.org/10.31949/educatio.v9i2.4780>.
- Lie, A. (2002) 'Cooperating Learning : Practicing Cooperative Learning in Classrooms ' , p. 95.
- Maryoto, G. (2016) 'The influence of TPS and NHT types of cooperative learning on the motivation and learning outcomes of mathematics on the material of relations and functions of class VIII students of SMP Negeri 1 Prigen (Master's Thesis, Open University). Open University Institutional Repository'.
- Monalistyani, I. et al. (2024) 'Cultivating Critical Thinking in Elementary School Children Through Group Learning (Cooperative Learning)', *Elementary School Teachers Journal* , 1(1), pp. 51–59. Available at: <https://doi.org/10.70277/jgsd.v1i1.0007>.
- Noorhidayati, Nisa, K. and Hardiansyah (2018) 'Application of a Combination of PBL and NHT Learning Models to Improve Student Activities and Learning Outcomes on the Concept of Function', *QUANTUM: Journal of Science Education Innovation* , IX(2), pp. 144–149.
- Odja, AH (2010) 'NHT type cooperative learning model with inquiry approach to improve mastery of light concept and critical thinking of junior high school students (Master's thesis, Indonesian University of Education). Indonesian University of Education Repository'.
- Putriasih, NN (2020) 'Implementation of Clinical Supervision Based on the Tri Hita Karana (THK) Concept to Improve Teacher Performance at SD Negeri 1 Banyuning in the Odd Semester of the 2017/2018 Academic Year', *Journal of Education Action Research* , 4(2), pp. 185–191. Available at: <https://doi.org/10.23887/jear.v4i2.24874>.
- Rahmaliana, Y. and Mahmuddin (2023) 'Improving Learning Activities and Outcomes Using Problem Solving and Numbered Head Together Models in Grade 5 of SDN 3 Sungai Danau', *Journal of Educational Technology and Learning (JTTP)* , 01(02), pp. 307–314.
- Redhana IW. (2013) 'Problem-based learning model for improving problem-solving and critical thinking skills', *Journal of Education and Teaching* , 46(1), p. 11.
- Sugiyono (2019) *Quantitative, Qualitative, and R&D Research Methods* . 27th edn. Bandung: Alfabeta.
- Suharti, S. (2020) *Teaching and Learning Strategies* . Edited by T. Lestari. Surabaya: CV. Jakad Media Publishing.
- Suprijono, A. (2009) *Cooperative learning theory & application of PAIKEM* . Yogyakarta: Pustaka Pelajar.

- Susanto, J. (2012) 'Development of Lesson Study-Based Learning Devices with Numbered Heads Together Cooperative Type to Improve Science Learning Activities and Outcomes in Elementary Schools', *Journal of Primary Educational* , 1(2), pp. 71–77.
- Syarif, M. (2016) 'Learning with a Problem Solving Approach to Improve High School Students' Critical and Creative Mathematical Thinking Skills.', *Pasundan Journal of Mathematics Education : Journal of Mathematics Education* , 6(1), pp. 56–75. Available at: <https://doi.org/10.23969/pjme.v6i1.2723>.
- Ummaha, IN et al. (2022) 'The Effect of Using the Problem Solving Learning Model on the Interest and Learning Outcomes of Indonesian Language in Grade VI Students of SDN Ponngok 3', *Auladuna : Journal of Elementary School Teacher Education Study Program* , 4(2), pp. 114–125. Available at: <https://doi.org/10.36835/au.v4i2.1112>.
- Ustman, A. (2006) *Educational Research Methodology* . Jakarta: Bumi Aksara.
- Widhy Hastuti, P., Widowati, A. and Setyowarno, D. (2018) 'Implementation of Problem Based Learning Model to Improve Problem Solving and Curiosity in Science 1 Learning', *PSEJ (Pancasakti Science Education Journal)* , 3(1), pp. 49–57. Available at: <https://doi.org/10.24905/psej.v3i1.92>.
- Yulia, Y. and Wijaya, PA (2013) 'Application of Problem Solving Method in STAD Type Cooperative to Improve Student Learning Outcomes in Economics', *Ekuitas: Journal of Economic Education* , 1(1), pp. 51–63. Available at: <https://doi.org/10.23887/ekuitas.v1i1.12761>.