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The effect of Domino Card-assisted problem-based learning on elementary school students' responsibilities and learning outcomes

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Abstract

The implementation of problem-based learning (PBL) assisted by domino cards has the potential to enhance elementary school students' responsibility character and cognitive learning outcomes. This study aimed to examine the effect of PBL assisted by domino cards on students' responsibility character and cognitive achievement. A quantitative approach with a quasi-experimental design was employed. The participants consisted of 63 fourth-grade students, with 31 students in the experimental group and 32 students in the control group. The groups were relatively homogeneous in terms of age, grade level, and academic ability. Data were collected through observation, pre-test and post-test, interviews, and documentation. The test instruments were piloted with 36 students to ensure validity and reliability. Data analysis involved descriptive statistics, prerequisite tests (normality and homogeneity), ANCOVA, and Pearson correlation analysis. The prerequisite tests indicated that the data were normally distributed and homogeneous. The ANCOVA results showed that PBL assisted by domino cards had a significant effect on students' responsibility character (Sig. = 0.012; Partial Eta Squared = 0.100) and cognitive learning outcomes (Sig. < 0.001; Partial Eta Squared = 0.253). In addition, Pearson correlation analysis revealed a positive and significant relationship between responsibility character and cognitive learning outcomes (r = 0.463; Sig. = 0.009). These results imply that schools and educational stakeholders may consider implementing PBL supported by contextual media as an effort to improve learning quality and strengthen the Pancasila Student Profile, particularly the dimension of responsibility.

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1. Introduction

Strengthening students' character and understanding through contextual and concrete problem-based learning is highly relevant to the needs of elementary school students. Elementary school is the initial stage of formal education where students begin to develop academic responsibility and

internalize fundamental character values (Achadah et al., 2022). This aligns with the Pancasila Student Profile in the Merdeka Curriculum and the Regulation of the Minister of Education, Culture, Research, and Technology No. 13 of 2025, which emphasizes the integration of intellectual development and character education. Therefore, learning models that combine cognitive achievement with character formation, such as problem-based learning supported by contextual media, are essential at the elementary level (Tirtawati et al., 2025). In elementary school, responsibility character is reflected in students' ability to understand and carry out their duties as learners in a consistent manner. Burden (2020), responsible students complete assignments on time, follow classroom rules, actively participate in group activities, take care of learning materials, and fulfill their roles without constant reminders. For example, students are able to finish tasks according to instructions, contribute responsibly in group discussions, and revise their work when necessary.

This portrait aligns with the Merdeka Curriculum, which emphasizes the Pancasila Student Profile, particularly the dimension of *Faith in God Almighty and Noble Character*. Within this dimension, civic morality highlights students' responsibility to understand and perform their rights and obligations in the school environment. Strengthening responsibility character is essential to ensure that students' understanding of these values is translated into real actions (Sartika et al., 2024). Ideally, elementary students' cognitive learning outcomes are demonstrated not only through correct answers but also through their ability to explain concepts, apply knowledge to everyday situations, and solve simple contextual problems. Learning models that are active, contextual, and problem-oriented, such as Problem-Based Learning supported by concrete media, provide meaningful learning experiences that simultaneously enhance cognitive achievement and foster students' responsibility character.

According to Petkou et al., (2025), fostering students' responsibility character from an early age is a crucial task for educators. However, field observations indicate that many elementary school students still demonstrate low levels of responsibility. Interviews with a classroom teacher at SDN 05 Kota Bengkulu revealed that several students frequently failed to complete homework due to forgetting assignments or leaving their books at home. Similar issues were observed during classroom activities, particularly in group learning, where participation was often dominated by only a few students while others remained passive.

This condition negatively affects students' learning processes and outcomes, as limited responsibility reduces active engagement, meaningful understanding, and independence. Students who lack responsibility tend to rely heavily on teachers or peers and show weak self-regulation skills. These findings are consistent with previous studies by Cook-Sather & Luz (2015) and Wiggins

et al. (2017), which report that insufficient student engagement and responsibility remain persistent challenges in classroom learning. If not addressed early, a low responsibility character may hinder students' academic development and readiness for future learning stages.

Low cognitive learning outcomes among elementary school students constitute a serious educational problem that directly affects the quality of learning. Character development should not be separated from efforts to improve students' academic performance, particularly cognitive learning outcomes, as both are closely interconnected. Cognitive learning outcomes function as indicators of students' mastery of learning material, including their ability to understand concepts, apply knowledge, and solve problems (Susanti & Muktadir, 2025). According to (Bjorklund, 2022), cognitive outcomes involve intellectual development through mental processes ranging from basic recall to higher-order thinking skills.

In classroom practice, low learning outcomes are commonly indicated by students' difficulty in explaining concepts in their own words, limited ability to answer contextual and application-based questions, and dependence on memorization rather than meaningful understanding. Students with low cognitive achievement often struggle to connect lesson content to real-life situations and show weak problem-solving skills during learning activities.

Based on the teacher's document analysis, 60% of fourth-grade students at SDN 05 Kota Bengkulu did not meet the Learning Mastery Criteria of 7.00 in Pancasila Education assessments. This finding reflects a gap between expected learning objectives and actual student performance. Previous studies have similarly reported that low student engagement, limited use of contextual learning models, and teacher-centered instruction contribute to weak cognitive outcomes. If this condition persists, it may negatively affect students' learning motivation, academic confidence, and readiness for higher levels of education. Therefore, concrete instructional efforts are required to improve learning outcomes through learning models that integrate cognitive development with character education.

Learning models serve as systematic frameworks designed by teachers to guide instructional processes. Kustyarini et al., (2020) and Kandia et al., (2023) asserts that learning models and media play a vital role in achieving learning objectives. Interviews with the teacher further revealed that Pancasila Education at SDN 05 Kota Bengkulu still relied on conventional methods such as lectures and group discussions, with limited learning resources such as textbooks, worksheets, and miniature Garuda symbols. The lack of instructional variety has hindered the optimal transfer of knowledge. This finding supports(Nurasiah et al., 2022), who argue that teachers must design appropriate learning models and media to ensure academic outcomes and character values become internalized behaviors.

One instructional model aligned with the principles of the Merdeka Curriculum is Problem-Based Learning (PBL). This model facilitates character formation by directly engaging students in critical thinking, real-world problem-solving, and collaborative work conditions that effectively foster responsible character (Mulia et al., 2024). PBL has also been proven to improve cognitive learning outcomes because students construct knowledge through active engagement rather than passive reception (Almulla, 2020). (Ariffiando et al., 2023), reported that PBL enhances students' Pancasila Education learning outcomes in elementary schools. Thus, PBL is considered capable of simultaneously improving responsible character and cognitive performance.

To implement PBL effectively, engaging and developmentally appropriate learning media are required (Muktadir et al., 2024). Considering that elementary students have a natural inclination toward play, teachers need media that integrate play elements with learning. One such medium is domino cards, which are easy to prepare, affordable, and adaptable to instructional content. Domino cards contain text or images arranged similarly to traditional dominoes. (Anabella & Wulandari, 2024)and (Nasyawa & Asih, 2025), state that domino card media is highly feasible for use in learning activities. Findings from Adiani & Kristiantari (2020) also indicate that its use can improve students' learning outcomes. Furthermore, according to Susanti & Muktadir (2025), the visual and interactive characteristics of the media help students understand concepts more effectively while simultaneously enhancing their learning outcomes.

Based on the identified problems, this study is urgent because existing literature shows that research on Problem-Based Learning (PBL) has largely focused on improving cognitive learning outcomes, while empirical studies that explicitly examine responsibility character, particularly in elementary Pancasila Education, remain limited. Moreover, few studies integrate concrete and age-appropriate learning media within PBL to simultaneously enhance character development and academic achievement, indicating a clear gap in current research.

The novelty of this study lies in integrating PBL with domino cards as concrete learning media and positioning responsibility character as a primary outcome alongside cognitive learning outcomes. This research provides empirical evidence from the elementary school context under the Merdeka Curriculum, contributing to the strengthening of the Pancasila Student Profile. This study is grounded in constructivist learning theory as the grand theory, supported by character education theory and social learning theory as contextual frameworks. These theories emphasize meaningful learning, social interaction, and responsibility development through authentic problem-solving activities (Widayanthi et al., 2024). Therefore, this study aims to examine the effect of PBL assisted by domino cards on students' responsibility character and cognitive

learning outcomes, while contributing both theoretically and practically to the development of instructional strategies that integrate academic learning with character education in elementary schools.

2. Methods

This study used a quasi-experimental method with a Matching Pretest–Posttest Control Group Design. In this design, a pretest is given at the start, followed by a post-test at the end to assess the effectiveness of the treatment. In addition, a responsible character was observed before and during learning, while cognitive achievement was measured using pretest and post-test scores.

The selection of this design was based on field conditions, which did not allow the researcher to divide students from their original classes. The school had already set structured class divisions and learning schedules; therefore, to maintain the smooth running of teaching and learning activities, the researcher used intact classes as the experimental and control groups. Using intact classes also minimizes disruptions to students' learning comfort and prevents objections from teachers or school authorities. The research design can be illustrated as follows:

Table 1.
Research design matching only the pre-test, post-test, and control group design.

Group	Pre-test	Pre-Learning Observation	Treatment	During-Learning Observation	Post-test
Experiment	O1	Obs1	X	Obs2	O2
Control	O3	Obs3	-	Obs4	O4

Notes:

a) O1: Measurement of the initial cognitive ability of the experimental group.
b) O3: Measurement of initial cognitive ability of the control group.
c) Obs1: Observation of the initial responsible character in the experimental class.
d) Obs3: Observation of the initial responsible character in the control class.
e) X: Treatment, namely the implementation of (PBL) assisted by domino cards.
f) Obs2: Observation of the development of responsible character during learning in the experimental class.
g) Obs4: Observation of the development of responsible character during learning in the control class.
h) O2: Measurement of cognitive learning outcomes after treatment in the experimental class.
i) O4: Measurement of cognitive learning outcomes in the control class.

Based on the research design, both the experimental and control groups participated in two stages of testing. A pre-test was administered to identify initial differences between the groups before the intervention. The experimental group then received the treatment in the form of Problem-Based Learning supported by domino card media, while the control group followed conventional instruction.

After the intervention, a post-test was administered to both groups to measure the effect of the treatment.

The population of this study consisted of all fourth-grade students at SD Negeri 05 Kota Bengkulu in the first semester of the 2025/2026 academic year, comprising four classes (IV A, IV B, IV C, and IV D). The sample was selected using purposive sampling based on the similarity of students' initial academic abilities, as indicated by the Competency Achievement Criteria. Preliminary analysis showed that approximately 60% of students in the selected classes did not meet the minimum competency level, indicating comparable academic profiles.

Based on these considerations, class IV C (31 students) was assigned as the experimental group and class IV B (32 students) as the control group, resulting in a total of 63 participants. This study was conducted in accordance with research ethics principles. All participants were involved voluntarily after obtaining permission from the school and informed consent from parents or guardians. Furthermore, the researchers ensured the confidentiality of participants' personal data by anonymizing all identities in the research report and using the data solely for academic and scientific purposes. Prior to implementation, the test instruments were piloted in class IV D, consisting of 36 students, to ensure their validity and reliability. Details of the population and sample distribution are presented in Table 2.

Table 2.
Population and sample data matched only the pre-test, post-test, and control group design.

No	Class	Number of Students	Description
1	IV A	37	-
2	IV B	32	Control Class
3	IV C	31	Experimental Class
4	IV D	36	Pilot Class

(Source: Teacher Documents)

The research instruments used in this study consisted of observation sheets and achievement tests, supported by interview guidelines and documentation. Observation sheets were employed to assess students' responsibility character during the learning process, including indicators such as task completion, active participation, and adherence to learning rules. The test instruments, administered as pre-tests and post-tests, were used to measure students' cognitive learning outcomes in Pancasila Education.

The validity of the instruments was established through content validity, which covered aspects of material relevance, construction, and language. Material validity ensured that the items were aligned with learning objectives, indicators, and the content of Pancasila Education. Construct validity focused on the clarity, structure, and suitability of the items with the intended cognitive levels

and observed behaviors. Language validity ensured that the wording was clear, unambiguous, and appropriate to the developmental level of elementary school students. Instrument validation was conducted through expert judgment, followed by a pilot test to refine the instruments. Only valid instruments were used for data collection to ensure the accuracy and credibility of the research findings. The data collection procedures included: (1) observation; (2) tests (pre-test and post-test); (3) interviews; and (4) documentation. Research instruments are tools used to measure natural or social phenomena under observation (Sugiyono, 2022). In essence, research involves measurement; therefore, appropriate measuring instruments are required. In this study, the instruments used were observation sheets and tests.

The data obtained from the observation sheets were analyzed descriptively to identify patterns of student activities and the implementation of learning processes in both groups. Meanwhile, the test data were analyzed quantitatively using inferential statistical techniques. Prior to hypothesis testing, prerequisite tests were conducted, including normality and homogeneity tests, to ensure that the data met the required assumptions. Subsequently, an independent samples t-test was employed to determine whether there was a significant difference between the experimental and control groups. All statistical analyses were conducted at a significant level of 0.05.

3. Results

3.1 Description of responsible character data

The development of students' responsible character scores in the experimental and control classes is presented in Table 3, showing the average scores from pre- and during-learning observations.

Table 3.
Average scores of responsible characters.

Aspect	Experimental Group (Min–Max–Mean)	Control Group (Min–Max–Mean)
Mean score of pre-learning observation	4 – 9 – 6.23	3 – 9 – 5.84
Mean score of the during-learning observation	4 – 9 – 7.00	3 – 9 – 6.13

Source: Results of research data analysis

Students' responsible character data were obtained through observation sheets provided by the researcher to the teachers during the learning process. Observations were conducted in both the experimental and control classes. Table 4 shows that the average responsible character score in the experimental class increased from 6.23 at the beginning of observation to 7.00 after the treatment. In the control class, the score increased from 5.84 to 6.13. This indicates that both classes experienced an increase in responsible character scores, with the

experimental class showing a higher increase than the control class. Figure 1 shows a comparison of the responsibility character scores between the two groups.

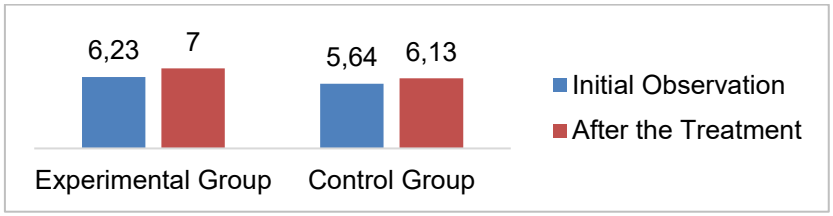

Fig. 1. Comparison graph of the average responsibility character scores.

Source: Results of research data analysis

Table 4.
Frequency distribution of the responsible character in the experiment and control groups.

Category	Score Range	Percentage of Control Group	Percentage of Experimental Group
Developing	7–9	47%	68%
Emerging	4–6	47%	32%
Initial	1–3	6%	–
Not Yet Appeared	0	–	–

Source: Results of research data analysis

Compared to the control class, the experimental class had a higher proportion of students in the “developing” category.

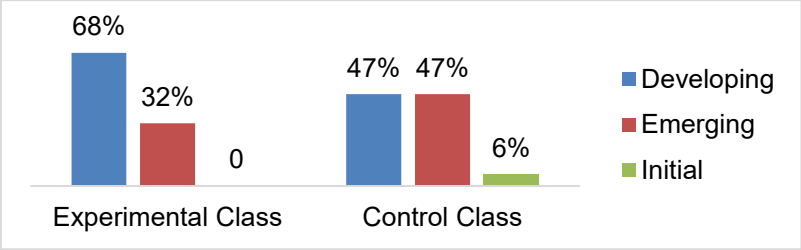

Fig. 2. Frequency distribution of the responsible character.

Source: Results of research data analysis

3.2 Description of cognitive learning outcomes

The students’ cognitive learning outcomes in the experimental and control groups are presented in Table 7.

Table 7.
Average scores of cognitive learning outcomes.

Data Type	Minimum Score	Maximum Score	Mean
Pre-test – experimental class	0	100	57.74
Post-test – experimental class	40	100	76.13
Pre-test – control class	40	100	67.19
Post-test – control class	30	100	68.44

Source: Results of research data analysis

Cognitive learning outcomes were assessed using multiple-choice tests given before and after the treatment. In the experimental groups, the average score rose from 57.74 on the pre-test to 76.13 on the post-test. Meanwhile, the control group showed a smaller increase, from 67.19 to 68.44.

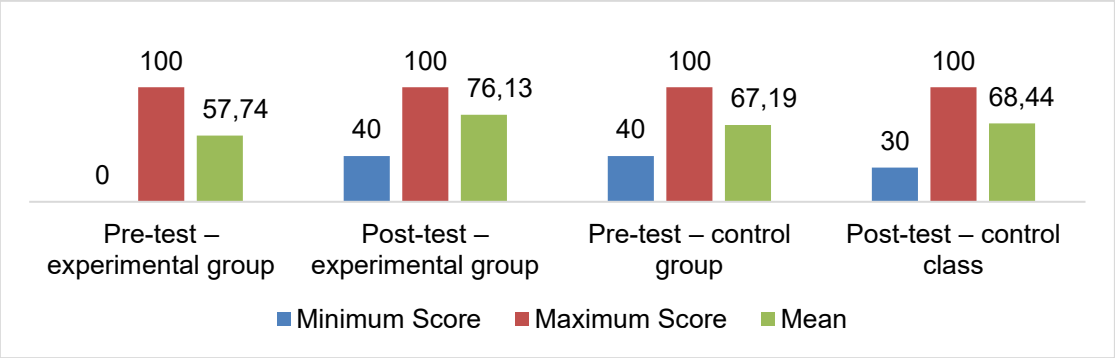

Fig. 3. Average scores of cognitive learning outcomes.

Source: Results of research data analysis

Table 5.
Cognitive learning outcomes of the experimental and control groups.

Groups	N	Lowest Score	Highest Score
Experimental	31	40	100
Control	32	30	100

Source: Results of research data analysis

The frequency distribution of cognitive learning outcomes in the experimental group is shown in Table 6.

Table 6.
Frequency distribution of cognitive learning outcomes of the experimental group.

Category	Score Range	Number of Students	Percentage
Very High	86–100	8	26%
High	71–85	8	26%
Moderate	56–70	12	39%
Low	<55	3	9%

Source: Results of research data analysis

The majority of students in the experimental class were in the “moderate” category (39%), followed by “very high” and “high” categories (26% each), and “low” (9%). In the control group, the distribution is shown in Table 7.

Table 7.
Frequency distribution of cognitive learning outcomes of the control group.

Category	Score Range	Number of Students	Percentage
Very High	86–100	7	21%
High	71–85	6	19%
Moderate	56–70	10	31%
Low	<55	9	29%

Source: Results of research data analysis

Compared with the control group, the experimental group had more students in the “moderate,” “high,” and “very high” categories, indicating greater improvement in cognitive learning outcomes.

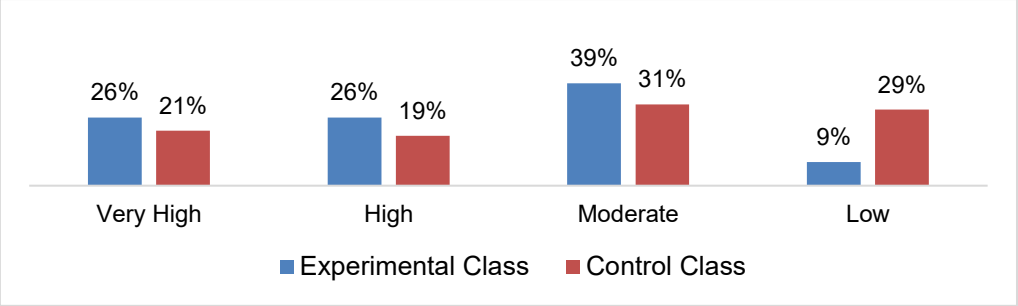

Fig. 4. Frequency Distribution of Cognitive Learning Outcomes

Source: Results of research data analysis

3.3 Comparison of Responsible Character and Cognitive Learning Outcomes

The effect of Problem-Based Learning (PBL) assisted by Domino Cards on students’ responsible character was tested using ANCOVA, controlling for pre-learning scores. As shown in Table 8, the ANCOVA results show a significance value of 0.012 (< 0.05), indicating a significant effect. The partial eta squared value of 0.100 suggests that PBL with domino cards contributed 10% to the improvement of students’ responsible character. These findings demonstrate that this learning model effectively enhances students’ sense of responsibility during Pancasila learning in grade IV.

Table 8.
ANCOVA results – responsible character.

Variable	F	Sig.	Partial Eta Squared	Conclusion
Responsible Character	6.660	0.012	0.100	Significant Effect

Source: Results of research data analysis

The effect of problem-based learning with Domino Cards on cognitive learning outcomes was also tested using ANCOVA, controlling for pre-test scores. As shown in Table 9, the results show a significance value of <0.001 (<0.05), confirming a significant effect. The partial eta squared value of 0.253 indicates that PBL with domino cards contributed 25.3% to the improvement of cognitive learning outcomes. These results suggest that this model effectively enhances students’ understanding and application of Pancasila concepts.

Table 9.
ANCOVA results – cognitive learning outcomes.

Variable	F	Sig.	Partial Eta Squared	Conclusion
Cognitive Learning Outcomes	20.336	<0.001	0.253	Significant Effect

Source: Results of research data analysis

3.4 Relationship Between Responsible Character and Cognitive Learning Outcomes

The Pearson Product-Moment test showed a correlation coefficient of 0.463 with a significance of 0.009 (<0.05), indicating a moderate positive link between responsible character and cognitive outcomes. This means students with higher responsibility tend to achieve better cognitive scores.

Table 10.
Pearson correlation – responsible character and cognitive learning outcomes.

Variable 1	Variable 2	r	Sig.	N	Conclusion	
Responsible Character	Cognitive Learning Outcomes	0.463	0.009	31	Significant Relationship	Positive

Source: Results of research data analysis

In addition to the test results, the research findings were complemented by observation and interview data. Observations of students' responsibility character revealed variations across indicators, showing that PBL assisted by domino cards was particularly effective in promoting task discipline and adherence to instructions, while active participation in group activities still required additional support. Interview data with the class teacher reinforced these findings, noting that students in the experimental class were more motivated to complete assignments, follow the learning steps, and engage in group discussions compared to the control class. Several students also reported that using domino cards made learning more enjoyable and easier to understand, which enhanced their sense of responsibility in completing tasks. Overall, the observation and interview results provide a deeper understanding of how PBL with domino cards improves behavioral engagement and the internalization of responsibility, complementing the quantitative evidence from the test scores.

4. Discussion

4.1. The Effect of Problem-Based Learning Assisted by Domino Cards on Responsible Character

ANCOVA results showed that PBL assisted with domino cards significantly improved students' responsible character. The experimental class scored higher than the control class after treatment, indicating that the model encourages responsibility through active problem identification, collaboration, and task completion. This aligns with Lickona (2013), who explains that responsibility grows through understanding, feeling, and practicing moral behavior, as well as Rachman (2017), who notes that character develops through consistent habituation in learning.

Furthermore, a recapitulation of observation scores in the experimental class revealed differences across three observed indicators. The indicator

“completing tasks well” showed the highest total score of 81, indicating that most students completed the assigned tasks properly during PBL assisted by domino cards. The “submitting tasks according to instructions” indicator scored 74, ranking second. Activities in the PBL model, particularly the use of domino cards that must be arranged and understood following specific rules, help students comply with instructions. The “actively participating in group learning” indicator scored the lowest at 62. This lower score may be due to differences in students’ communication skills and self-confidence in group work. Not all students were willing to express opinions or take active roles during discussions, which aligns with (Lickona, 2013), who notes that developing responsibility in collaborative contexts requires long-term habituation and repeated opportunities for engagement. The research conducted by Lencana & Agusdianita (2025) confirms that PBL is capable of encouraging students to actively engage in the problem-solving process, resulting in a significant improvement in students’ independent learning attitudes. Furthermore, the study by (Triani et al., 2019) and (Agusdianita et al., 2023) demonstrates that PBL is not only feasible and practical, but also effective in enhancing student engagement, conceptual understanding, and independent problem-solving abilities. These findings further strengthen the evidence that the implementation of PBL.

Viewed through the lens of constructivist learning theory as the grand theory, these findings indicate that students actively construct understanding and character through direct engagement with meaningful problems and concrete learning experiences. Problem-Based Learning positions students as active learners who are responsible for completing tasks, following procedures, and collaborating with peers, which explains the high scores in task completion and compliance with instructions. From a contextual character education perspective, the use of domino cards functions as a concrete and rule-based medium that supports responsibility formation by requiring accuracy, discipline, and accountability in learning activities.

The lower score in active group participation reflects the social dimension of character development, which, as emphasized in character education theory, requires continuous practice and structured opportunities for interaction. Therefore, PBL assisted by domino cards plays a dual role: cognitively, it facilitates meaningful problem-solving through concrete media, and affectively, it strengthens responsibility character by embedding values of commitment and rule adherence within the learning process, although sustained scaffolding is still needed to optimize students’ active participation in collaborative settings. Overall, these results suggest that PBL assisted by domino cards is most effective in promoting task completion and adherence to instructions, while active participation in groups still requires further support through strategies that encourage full involvement of all group members.

4.2. The Effect of Problem-Based Learning Assisted by Domino Cards on Cognitive Learning Outcomes

ANCOVA results revealed that the PBL model assisted with domino cards had a significant impact on students' cognitive learning outcomes. The experimental class obtained higher post-test scores, showing that this approach increases student engagement in understanding content, collaborating, and solving problems. The use of domino cards also makes learning more enjoyable and helps strengthen concept mastery. These findings align with Madhuri et al., (2012); Suastra et al., (2019), who notes that PBL promotes higher-order thinking through inquiry. They are also in line with (Gusman, 2023), who found that PBL can enhance elementary students' cognitive achievement. Similarly, Nargundkar et al. (2014) and Anggraeni et al. (2023) report that PBL improves skills such as identifying problems, forming hypotheses, analyzing evidence, and reflecting on learning.

Analysis of cognitive learning outcomes in the experimental class revealed variations across cognitive levels. The C2 level (understanding) achieved the highest total score of 85 correct answers, demonstrating that PBL assisted by domino cards effectively helps students understand concepts more deeply. During discussion and domino card arrangement activities, students repeatedly read, grouped, and connected information, strengthening concept comprehension.

The C3 level (applying) ranked second with a score of 65. PBL activities that require problem-solving and application of concepts within the domino card game contributed to this outcome. Arranging domino cards based on inter-concept relationships provided concrete learning experiences, helping students apply knowledge in new situations. The C1 level (remembering) scored 45, ranking third. Although students could understand and apply concepts, their ability to recall basic material was not fully optimal. Problem-based learning emphasizes concept exploration over rote memorization, explaining the lower achievement at C1. The C4 level (analyzing) obtained the lowest score of 38.

The findings can be explained by the nature of Problem-Based Learning, which emphasizes understanding and applying concepts through contextual problem situations rather than immediately mastering complex analytical processes. The use of domino cards provides concrete representations that help students organize information, recognize patterns, and apply concepts accurately, thereby strengthening conceptual understanding and task execution. However, analytical skills demand higher-order cognitive processing, such as evaluating relationships among concepts and drawing inferences, which typically develop through sustained exposure and repeated problem-solving experiences. Limited instructional time and students' varying readiness levels may have

constrained deeper analytical engagement. In this regard, the present findings extend constructivist learning theory by demonstrating that concrete media within PBL effectively scaffold basic to intermediate cognitive processes, while advanced analytical thinking requires additional scaffolding and longer learning cycles. These results are consistent with previous studies that report PBL's strong impact on conceptual understanding but more gradual effects on higher-order analysis, positioning this study as complementary evidence that highlights the role of instructional media and learning duration in optimizing PBL outcomes.

4.3. The Relationship Between Responsible Character and Cognitive Learning Outcomes

The Pearson Product–Moment correlation analysis revealed a positive and significant relationship of moderate strength between students' responsibility character and their cognitive learning outcomes. This finding indicates that responsibility contributes meaningfully to learning achievement through concrete learning behaviors, such as completing tasks on time, engaging seriously in learning activities, and sustaining effort during the learning process.

Theoretically, this result supports the view that responsibility functions as an affective driver that enhances cognitive performance. In constructivist learning theory, active engagement and persistence are essential for knowledge construction, as learners develop understanding through continuous interaction with learning tasks (Chuang, 2021). From the perspective of character education, responsibility serves as an internal control that promotes self-regulation, perseverance, and learning motivation, which directly influence academic success (Lickona, 2013). Previous empirical studies also confirm that responsible students tend to display stronger learning engagement and self-discipline, leading to higher cognitive achievement (Susanti et al., 2023). Therefore, the findings of this study clarify the role of responsibility character as a key mechanism linking students' learning behaviors with their cognitive learning outcomes, thereby reinforcing and extending existing theoretical and empirical evidence.

These findings support (Lickona, 2013), which explains that character education is inseparable from academic achievement. Students with strong character, such as responsibility, tend to be more academically successful due to good study habits and ownership of their tasks. Moreover, this result aligns with (Jeynes, 2019) and (Indriani & Asfia, 2023), who found a positive relationship between responsible character and learning outcomes in elementary students. This demonstrates that character development through active and collaborative learning models directly impacts academic achievement.

The findings of this study contribute theoretically by reinforcing the position of responsibility character as an affective factor that plays a strategic role in improving students' cognitive learning outcomes. This study extends

constructivist learning and character education theories by providing empirical evidence that responsibility functions as a mechanism linking students' learning behaviors with academic achievement, particularly within the context of Problem-Based Learning (PBL) assisted by concrete media Nurhuda et al. (2023). Previous research has also highlighted that integrating character development into active and contextual learning can enhance both engagement and understanding (Agusdianita et al., 2023).

Practically, the results imply that teachers and schools should intentionally integrate character development, especially responsibility, into instructional design. The use of PBL supported by domino cards offers a concrete and contextual instructional strategy that simultaneously promotes active learning, task accountability, and conceptual understanding (Madhuri et al., 2012; (Suastra et al., 2019)). Educators are encouraged to design problem-based activities with clear roles, structured tasks, and tangible learning media to foster students' responsibility while improving learning outcomes. At the policy level, these findings support the integration of media-assisted PBL models as part of efforts to strengthen the Pancasila Student Profile in elementary education ((Rehman et al., 2024)).

Despite its contributions, this study has several limitations. It was conducted in a single school with a relatively small sample size, which may limit the generalizability of the findings. The intervention period was also relatively short, potentially constraining the long-term development of responsibility character. Future research should involve larger and more diverse samples, extend the implementation period, and explore additional variables such as self-efficacy or collaborative skills to gain a more comprehensive understanding of the impact of PBL on character and cognitive learning outcomes.

5. Conclusion

The findings of this study demonstrate that the integration of Problem-Based Learning supported by domino cards creates a learning environment that simultaneously strengthens students' sense of responsibility and deepens their cognitive understanding. The learning process encourages students to take ownership of their tasks, collaborate meaningfully, and engage in sustained problem-solving, which collectively fosters responsible behavior as part of their character development. At the same time, the model stimulates higher-order thinking by positioning students as active constructors of knowledge rather than passive recipients, resulting in improved cognitive outcomes. Conceptually, this study contributes to the broader theory of knowledge by showing that character formation and cognitive achievement are not separate educational goals but mutually reinforcing processes that can be cultivated through well-designed instructional models. The integration of responsibility-oriented activities within

problem-based tasks suggests that meaningful learning emerges when cognitive engagement intersects with character development, providing a pedagogical insight that can inform future instructional design, especially in Pancasila education.

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