

Fostering the Use of Talking Stick Learning Model on the Critical Thinking Ability in Science Learning

Muktar Bahrudin Panjaitan^{1,*}, Asister Fernando Siagian¹, Natalina Purba², Herman Herman³, Sutikno Sutikno⁴, Yanti Kristina Sinaga³ & Sabar Dumayanti Sihombing⁵

¹Department of Natural Science Education, Universitas HKBP Nommensen Pematangsiantar, Indonesia

²Department of Elementary School Teacher Education, Universitas HKBP Nommensen Pematangsiantar, Indonesia

³Department of English Education, Universitas HKBP Nommensen Pematangsiantar, Indonesia

⁴Department of Indonesia Language and Literature Education, Universitas Muslim Nusantara Al-Washliyah, Indonesia

⁵Department of Civics Education, Universitas HKBP Nommensen Pematangsiantar, Indonesia

*Correspondence: Department of Natural Science Education, Universitas HKBP Nommensen Pematangsiantar, Indonesia. E-mail: muktar.panjaitan@uhnp.ac.id

Received: September 2, 2025

Accepted: October 5, 2025

Online Published: October 13, 2025

doi:10.5430/jct.v14n4p14

URL: <https://doi.org/10.5430/jct.v14n4p14>

Abstract

This study aimed to investigate the influence of the Talking Stick learning model on the critical thinking skills of fourth-grade students in science (IPA) subjects. Conducted as a quantitative research using a pre-experimental One-Group Pretest-Posttest Design, the study involved 30 students from class IV at UPTD SD Negeri 122345 Pematangsiantar. Data were collected through critical thinking tests administered before and after the implementation of the Talking Stick model. The test instrument consisted of eight essay questions validated through Aiken's V formula, showing a high level of content, construct, and language validity. The results showed a significant increase in students' critical thinking skills after the intervention. The average pretest score was 44.86, whereas the posttest average rose to 88.83. The normalized gain (N-Gain) score reached 0.79, falling into the high category, indicating effective improvement in the learning process. The Talking Stick model, by encouraging turn-taking and structured student interaction, effectively enhances analytical thinking, reasoning, and active participation in science learning. These findings support the integration of active learning models into elementary education to develop critical thinking skills. The model's simplicity and effectiveness suggest that it is particularly suitable for primary-level classrooms. Therefore, educators and curriculum developers should adopt Talking Stick and similar strategies to promote 21st-century competencies. Further research is recommended to explore its application in diverse learning contexts and subject areas.

Keywords: talking stick, critical thinking, science learning, elementary education, active learning model

1. Introduction

In the ever-evolving landscape of education, the cultivation of critical thinking skills has emerged as a crucial objective across all learning levels, especially in the field of science. Critical thinking enables students to analyze claims, solve problems, and make informed decisions, which are vital skills for the 21st century (Herman et al., 2022; Panjaitan et al., 2025). For fourth graders, who are transitioning to more abstract reasoning, building such cognitive capacities during science learning lays a strong foundation for lifelong education.

Despite this need, traditional teacher-centered approaches remain prevalent in many classrooms, leading students to adopt passive roles focused on memorization rather than on analysis. In Indonesia, studies have revealed that limited engagement and one-way delivery methods continue to suppress critical thinking development (Panjaitan & Siagian, 2020; Rahmadhani et al., 2024). To address these challenges, cooperative learning has emerged as a powerful instructional approach that actively involves students in the learning process. Cooperative learning is characterized by students working together in small, structured groups to achieve shared learning goals. Unlike traditional group

work, it is intentionally designed to promote positive interdependence, individual accountability, face-to-face promotive interaction, interpersonal skills, and group processing (Johnson et al., 2014). This model encourages learners to take responsibility not only for their own learning but also to support the success of their peers, thereby fostering academic growth and social development.

Building on this concept, Slavin (1995) described cooperative learning as a strategy in which students collaborate in small groups to assist one another in mastering academic content. This approach transforms the teacher's role from a direct transmitter of knowledge to a facilitator who guides shared inquiry and knowledge construction (Ansari et al., 2023). Through this shift, cooperative learning cultivates a more interactive and student-centered classroom environment that enhances students' achievement, motivation, and retention.

Compounding this issue is the lack of instructional variety in the curriculum. Many educators default to familiar teaching models, widening the gap between students' interest and cognitive engagement. Rahmadhani et al. (2024) found that students exposed to monotonous methodologies displayed lower critical thinking, whereas those taught through the Talking Stick cooperative model showed significantly higher critical thinking abilities. The Talking Stick learning model, characterized by structured discourse where students take turns speaking while holding a "talking stick" has gained empirical support for cultivating critical thinking. Ahadia et al. (2020) documented moderate gains ($N\text{-gain} = 0.65$) in students' critical thinking when this model was supplemented with interactive media, compared to 0.35 in conventional settings

Furthermore, blended instructional designs that combine the Talking Stick with other active-learning strategies have demonstrated substantial improvements in both critical thinking and learning motivation. In a study among fifth graders, a blend of PBL, Talking Stick, and Demonstration methods propelled critical thinking from 25% to 83% and boosted motivation to 100%

The encouraging outcomes of the Talking Stick model are not limited to the sciences. In mathematics, the strategy significantly enhanced critical thinking in geometry (Yosa & Sundi, 2021), while a systematic review of physics education revealed average gains in critical thinking of up to 65% when the Talking Stick was applied (Hernandi et al., 2024). Taken together, these findings suggest that the Talking Stick learning model may effectively address long-standing pedagogical problems, such as passive learning and insufficient cognitive engagement, in fourth-grade science classrooms. However, despite its promise, research on its implementation in primary science contexts in Indonesia remains limited. This study aims to fill this gap by examining the impact of the Talking Stick model on fourth-graders' critical thinking skills in science, thereby contributing to both theory and practice in active learning strategies.

2. Literature Review

2.1 Theoretical Foundations Supporting the Talking Stick Model

The Talking Stick learning model aligns with foundational cognitive theories that emphasize dialogue, metacognition, and social interaction. The cognitive theory of interactive (inquiry) teaching outlined by Collins and Stevens (1981) posits that students develop a deep understanding through self-questioning, dialogue, and metacognitive reflection which are core processes inherent in the Talking Stick framework. Meanwhile, Vygotsky's theory of scaffolding proposes that peer-mediated discourse enables students to operate within their Zone of Proximal Development (ZPD), gradually internalizing higher-order cognitive skills (Vygotsky 1978, 1986). These perspectives underscore why structured conversational opportunities, such as those in Talking Stick sessions—can promote critical thinking among elementary learners.

2.2 Talking Stick and Higher-Order Thinking Skills

Empirical studies in Indonesian educational contexts have highlighted the efficacy of the Talking Stick model in enhancing critical thinking and related cognitive abilities. Halimatussa'diyah et al. (2021) explored the impact of Talking Stick using simple visual props on junior high students' higher-order thinking skills (HOTS), finding statistically significant improvements—medium-level normalized gains—for experimental classes compared to controls. Similarly, Ahadia et al (2020) reported moderate $N\text{-gain}$ improvements (0.65 vs. 0.35) in primary students' critical thinking when the Talking Stick model was augmented with PowerPoint media. These findings collectively suggest that both low-tech and media-enhanced Talking Stick implementations can meaningfully elevate students' analytical and evaluative capacities.

2.3 Subject-Specific Outcomes: Mathematics and Science

The effectiveness of the Talking Stick extends across subject domains. In mathematics education, Arifin & Laili (2022) demonstrated that fourth-grade students taught using Talking Stick exhibited significant gains in mathematical critical thinking skills, with pre- and post-test comparisons showing meaningful improvement ($p < 0.05$). In science, Rahmadhani et al. (2024) confirmed that fourth graders exposed to the Talking Stick model outperformed their peers in critical thinking tests, affirming the model's positive impact on elementary science settings. These subject-specific results underscore the adaptability of the Talking Stick to different content areas and student needs.

2.4 Broader Educational Outcomes beyond Critical Thinking

Beyond fostering critical thinking, the Talking Stick has also been found to enhance other learning outcomes. Adiko & Djafar (2022) implemented Talking Stick in social studies classes and observed steady increases in student learning completeness—from 54% to 93% across two action cycles—highlighting improvements in engagement and knowledge retention. While the primary focus is often on cognitive growth, these findings point to broader benefits, such as motivation and content mastery.

2.5 Effectiveness of the Talking Stick Learning Model

The Talking Stick learning model has been shown to be effective in enhancing students' critical thinking abilities, particularly in science and mathematics education. Empirical studies support the model's positive impact on students' learning outcomes. Arifin & Laili (2021), for example, found that the use of a cooperative learning model with the Talking Stick method significantly improved fourth-grade students' critical thinking skills in mathematics. Their findings indicated a marked difference between pre-test and post-test scores, suggesting the model's potential to foster deeper cognitive processing. Similarly, Rahmadhani et al. (2024) reported that students in science classes taught using the Talking Stick model demonstrated significantly higher critical thinking skills than those in the control group. This pattern has been echoed in other studies, such as Nurliyanti & Sari (2023), where integrating Talking Stick with demonstration and Problem-Based Learning (PBL) methods led to increased levels of student motivation and critical thinking across successive class meetings.

The effectiveness of the Talking Stick model lies in its structured and interactive approach to classroom discussions. One of its primary strengths is the way it enforces structured turn-taking, which ensures that every student has an opportunity to speak while others actively listen to them. This process fosters attentiveness, accountability, and respect in classroom dialogue, all of which are essential for developing critical thinking. By requiring students to articulate their ideas clearly when holding the "stick," the model promotes thoughtful communication and preparation before speaking. Furthermore, peer interaction is central to the Talking Stick approach. As students engage in discussions, they are exposed to diverse viewpoints that challenge them to evaluate, defend, or revise their thinking. This collaborative environment encourages reflective thinking and helps students socially construct knowledge, aligning well with constructivist learning theories (Siagian et al., 2023).

In addition to promoting engagement, the Talking Stick model enhances student agency and motivation. Because every student is expected to participate, learners often become more involved and invested in the learning process. Studies have shown that increased participation can create a more dynamic and inclusive learning environment, which in turn supports higher-level thinking (Nurliyanti & Sari, 2023). Moreover, the immediate feedback students receive during these discussions—both from peers and teachers—encourages real-time reflection and refinement of ideas. The model's impact is further amplified when combined with visual aids, demonstrations, or scaffolding techniques such as guided questioning, all of which help deepen students' understanding (Arifin & Laili, 2021).

However, the effectiveness of the Talking Stick model is not automatic and can be influenced by several contextual factors. Teacher facilitation is critical; educators must guide discussions, pose open-ended questions, and ensure equitable participation. Additionally, the model tended to yield more substantial outcomes when implemented over multiple sessions rather than as a one-time activity. Subject complexity and the availability of supporting media also affect their impact. Overall, the Talking Stick learning model, when used thoughtfully and in combination with appropriate strategies and tools, serves as a powerful approach to enhancing students' critical thinking skills in science and other fields.

2.6 Limitations and Future Directions in the Literature

Despite these robust positive findings, several gaps remain in the literature. Many studies utilize quasi-experimental designs with modest sample sizes and lack long-term follow-up, which limits their generalizability. Moreover, while the Talking Stick shows promise across individual subjects, few studies have explored its integration with other

active-learning models (e.g., PBL, inquiry-based learning). Comparative studies examining Talking Stick against alternative cooperative strategies (e.g., Jigsaw, Think–Pair–Share) remain scarce. These limitations suggest that future research should employ longitudinal designs, larger and more diverse samples, and comparative frameworks to fully evaluate the model's effectiveness and its optimal configurations.

3. Research Method

3.1 Type of Research

This study employed a quantitative approach with an experimental method to determine the effect of the Talking Stick learning model on students' critical thinking abilities. Quantitative research was chosen because it allowed for the objective measurement of changes in students' cognitive performance. The experimental component is essential for observing the direct impact of an intervention under controlled conditions. Creswell (2018) notes that experimental research is useful in determining causal relationships between variables by applying treatment to one group and measuring its outcomes.

3.2 Research Design

The design used in this study was a pre-experimental design, specifically the One-Group Pretest–Posttest Design, in which a single group is given a pre-test, followed by an intervention, and then a post-test. This design allowed the researcher to identify the learning gains attributable to the implementation of the Talking Stick method. The design was illustrated as follows:

Pre-test (O1) → Treatment (X) → Post-test (O2)

- O1 = Students' scores before the application of the learning model
- X = Treatment using the Talking Stick learning model
- O2 = Students' scores after the intervention

This design is appropriate when random assignment is not feasible, but internal validity can be maintained through pre- and post-measurements.

3.3 Research Setting and Timeline

The study was conducted at UPTD SD Negeri 122345, located in Kelurahan Pahlawan, Kecamatan Siantar Timur, Kota Pematangsiantar, North Sumatra, Indonesia. The focus was on a single intact class, specifically Grade IV, selected because of its accessibility and relevance to the research topic. The implementation took place during the odd semester of the 2025/2026 academic year, specifically in July 2025, coinciding with the start of formal classroom instructions.

3.4 Population and Sample

The population for this study comprised all fourth-grade students enrolled at UPTD SD Negeri 122345 in the 2025/2026 academic year. According to Ary et al. (2019), a population is an entire group of individuals sharing common characteristics relevant to a research question. The population consisted of 30 students with similar academic backgrounds and curricular exposure. The sample involved all 30 students from the population, selected using a total sampling technique (also known as saturated sampling), as the number of participants was small and manageable. This approach ensured that the results were representative of the class as a whole without introducing sampling bias (Etikan et al., 2016).

3.5 Research Variables

Based on the framework by Fraenkel et al (2015), variables in research are defined as elements or characteristics being measured and tested. This study includes:

- a. Independent Variable (X): The Talking Stick learning model, implemented as a structured cooperative learning strategy involving student interaction through guided discussion with a talking object.
- b. Dependent Variable (Y): Students' critical thinking ability in the context of science education, measured through standardized essay-based assessment tasks.

3.6 Research Instruments

To measure students' critical thinking skills, a written test in the form of 20 essay questions was constructed based on indicators derived from Ennis' (2011) critical thinking taxonomy. Each item aimed to capture a specific cognitive

indicator, such as interpretation, inference, evaluation, explanation, and self-regulation. A portion of the test (eight questions) was validated through expert review.

Table 1. Critical Thinking Test Blueprint

Indicator	Sub-Indicator	Item Numbers
Interpretation	Clarifying meaning, organizing ideas	1, 20
Analysis	Identifying arguments, assumptions	2, 19
Evaluation	Credibility of sources, reasoning	3, 18
Inference	Drawing conclusions, making predictions	4, 17
Explanation	Justifying methods, providing rationale	5, 16
Self-Regulation	Reflecting and self-correcting	6, 15

Scoring Rubric:

- Completely correct answer = 10 points
- Partially correct = 5 points
- Incorrect = 2 points
- No attempt or irrelevant = 0 points

The final scores were calculated as follows:

$$\text{Final Score} = \left(\frac{\text{Total Raw Score}}{\text{Maximum Score}} \right) \times 100$$

Prior to use, the instrument underwent expert validation by an academic and a practitioner to ensure alignment with cognitive learning outcomes. Items were analyzed using Aiken's V formula, where a score of $V \geq 0.8$ indicated acceptable content validity (Retnawati, 2016).

3.7 Data Collection Techniques

3.7.1 Test Administration

A pre-test was administered to assess the students' initial critical thinking skills. After several instructional sessions applying the Talking Stick model, a post-test was conducted to measure any gains in student performance.

3.7.2 Documentation

Supplementary data, such as classroom photographs, lesson plans, and observation notes, were gathered to provide context and support for the analysis. Documentation also served as an auxiliary tool for the triangulation.

3.8 Data Analysis Techniques

To determine the effectiveness of the Talking Stick model, the students' pre- and post-test results were analyzed using the Normalized Gain (N-Gain) formula:

$$\text{N-Gain} = \frac{\text{Post-test Score} - \text{Pre-test Score}}{\text{Maximum Score} - \text{Pre-test Score}}$$

Table 2. Interpretation of N-Gain Scores (Hake, 1999):

N-Gain Value	Interpretation
$g > 0.70$	High
$0.30 < g \leq 0.70$	Moderate
$g \leq 0.30$	Low

This analysis helps identify the extent of learning improvement that occurred as a result of the intervention.

4. Results

4.1 Instrument Validation Results

Before the implementation of the study, the research instrument, comprising eight essay items designed to assess students' critical thinking in science, underwent a rigorous validation process. The validation was conducted by two experts: an academic (Dr. Aprido Fernando Simamora, M.Pd.) and a practitioner (Adelinar Manullang, S.Pd., a fourth-grade teacher at UPTD SD Negeri 122345). The instrument was evaluated based on content, construct, and language validity using Aiken's V coefficient. The following formula was applied:

$$V = \frac{\sum s}{n(c-1)} \quad \text{where } s = r - lo$$

Descriptions:

- VV: Aiken's V coefficient
- $\sum s$: Total score from all raters
- rr: Score given by validator
- lol: Lowest possible score (1)
- cc: Highest possible score (5)
- nn: Number of validators (2)

a) Content Validity

The results of the content validation are summarized in Table 3 below:

Table 3. Content Validity Results (Aiken's V)

Item	Validator I	Validator II	$\sum s$	N(c-1)	V	Description
1-8	4	4	6	6	1.0	Valid

Conclusion: All eight items were declared valid based on the Aiken's $V \geq 0.8$ threshold, indicating their suitability for measuring students' critical thinking ability related to the topic of energy and forms of energy transformation in natural science.

b) Construct Validity

Construct validity was also analyzed using Aiken's V. The results are shown in Table 4.

Table 4. Construct Validity Results (Aiken's V)

Item	Validator I	Validator II	$\sum s$	N(c-1)	V	Description
1-8	4	4	6	6	1.0	Valid

Conclusion: All items met the validity threshold for construct alignment, indicating that the questions appropriately reflected the theoretical dimensions of critical thinking.

c) Language Validity

Finally, the items were assessed for linguistic appropriateness and clarity.

Table 5. Language Validity Results (Aiken's V)

Item	Validator I	Validator II	$\sum s$	N(c-1)	V	Description
1-8	4	4	6	6	1.0	Valid

Conclusion: The language used in the test items was confirmed to be age-appropriate and easily understood by Grade IV students.

4.2 Students' Critical Thinking Test Results

To assess the effectiveness of the Talking Stick model, students were administered a pre-test and post-test consisting of eight essay questions. A pre-test was conducted on August 4, 2025, before the intervention. The post-test was

conducted after the instructional treatment. The minimum competency standard (KKTP) was set at 75.

Table 6. Pre-test and Post-test Results

Name	Pre-test	Post-test
AA	40	87
AZ	46	81
...	...	...
ZS	34	80
Mean	44.86	88.83

Conclusion: The average student score increased significantly from 44.86 (pre-test) to 88.83 (post-test). This preliminary result suggests a strong positive effect of the Talking Stick model on students' critical thinking abilities.

4.3 N-Gain Score Analysis

To determine the magnitude of the learning gain, the Normalized Gain (N-Gain) was calculated using the following formula:

$$\text{N-Gain} = \frac{\text{Post-test} - \text{Pre-test}}{\text{Ideal Score} - \text{Pre-test}}$$

Table 7. Summary of N-Gain Scores

Name	Pre	Post	N-Gain	N-Gain (%)	Category
AA	40	87	0.78	78.33%	High
AZ	46	81	0.65	64.81%	Medium
DP	31	100	1.00	100.00%	High
...	...	...	...	...	...
ZS	34	80	0.70	69.70%	Medium

Table 8. Summary of N-Gain Statistics

Statistic	N	Min	Max	Mean	Std. Deviation
N-Gain Score	30	0.55	1.00	0.7922	0.11383
N-Gain Percent	30	54.90	100	79.22	11.38

Interpretation:

According to Hake (1999), the interpretation of N-Gain is as follows:

Table 9. Interpretation of N-Gain

Score Range	Category
$g > 0.70$	High
$0.30 < g \leq 0.70$	Medium
$g \leq 0.30$	Low

The average N-Gain score was 0.79, which falls in the "high" category. This indicates a significant increase in students' critical thinking abilities after the Talking Stick learning model was applied. Furthermore, the mean gain of 79.22% reinforces the effectiveness of the intervention.

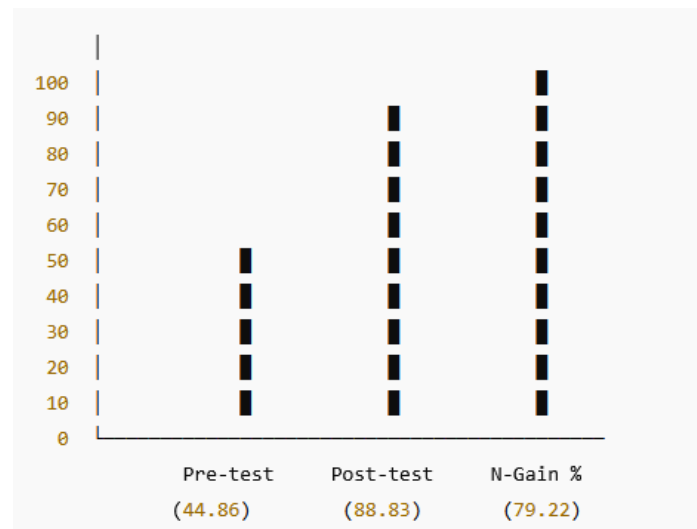


Figure 1. Comparison of Average Pre-test, Post-test, and N-Gain Scores

Figure 1 clearly depicts the positive impact of the Talking Stick learning model on students' critical thinking abilities. Initially, the students scored an average of 44.86 on the pre-test, indicating limited understanding of the material. After the instructional intervention using the Talking Stick method, there was a substantial increase in the post-test average to 88.83. This growth was quantitatively reinforced by the N-Gain score of 79.22%, which fell within the high-effectiveness category. This visual representation supports the interpretation that student engagement, collaboration, and the structured questioning strategy provided by the Talking Stick model successfully promoted higher-order thinking in science learning.

5. Discussion

The results of this study indicate that the Talking Stick learning model has a significant effect on the critical thinking abilities of fourth-grade students in science learning. This is evident from the improvement in students' scores from the average pre-test of 44.86 to the average post-test of 88.83, with an average N-Gain score of 0.79, which falls into the high category. These findings suggest that the Talking Stick method is not only engaging but also effective in promoting deeper cognitive processing, especially on topics such as energy and forms of energy transformation.

This finding supports previous research by Tamba et al. (2023), who demonstrated that student-centered models, such as Talking Stick, can stimulate active participation and enhance students' higher-order thinking skills. In this study, the integration of movement, oral communication, and group collaboration inherent to the Talking Stick method enabled students to analyze, interpret, and reflect on scientific information better.

Furthermore, the improvement in critical thinking aligns with Ennis' (2011) definition of critical thinking as the ability to reason effectively and make logical judgments based on evidence. The Talking Stick method encourages students to ask and answer questions, evaluate information, and articulate their reasoning, all of which are core components of critical thinking skills. The active nature of the model provided students with frequent opportunities to practice these skills in a supportive classroom environment.

These results are also in line with the findings of Kaharu et al (2023), who reported that the Talking Stick model significantly improves learning outcomes in science subjects due to its interactive and participatory nature. By promoting student engagement through cooperative learning and structured turn-taking, students are motivated to stay focused, express their opinions, and respond critically to questions posed by peers and the teacher.

In elementary science education, the ability to think critically is crucial, particularly when students begin to explore concepts that require observation, classification, and explanation of natural phenomena. Through this model, students developed not only factual knowledge but also the ability to evaluate evidence, draw inferences, and apply logic—skills fundamental to scientific thinking (Facione, 2015).

However, while the findings are promising, it is important to recognize that factors such as the classroom environment, teacher facilitation, and student motivation also play a role in the success of this approach. Therefore, while the Talking Stick model is effective, its success depends on skillful implementation and adaptation to the

specific needs of the classroom.

In conclusion, the data suggest that the Talking Stick learning model is highly effective in improving the critical thinking skills of elementary school students in science learning. This study contributes to the growing body of evidence supporting active learning strategies in elementary education and recommends the broader application of this model, particularly for fostering higher-order thinking skills in young learners.

Although the findings of this study indicate that the Talking Stick learning model can significantly enhance students' critical thinking abilities in science learning, the generalizability of these results is limited. This study employed a total sampling technique involving 30 fourth-grade students from a single intact class at an elementary school. As Etikan et al. (2016) note, total sampling is appropriate for small populations and allows for an in-depth analysis of the group under study. However, because the sample was not randomly selected from a larger or more diverse population, the results may not be representative of all elementary school students. Consequently, the findings should be interpreted within the context of specific educational settings, student characteristics, and instructional environments. To enhance external validity, future research should replicate this study across different schools, grade levels, and subject areas with larger and more varied samples. This would provide stronger empirical support for the wider application of the Talking Stick model in science education.

5.1 Implication

The findings of this study have several important implications for educational theory, teaching practice, and education policy, especially in the effort to strengthen students' 21st-century skills such as critical thinking. From a pedagogical standpoint, the results support integrating active, student-centered learning approaches into elementary classrooms. The Talking Stick model was effective in engaging students and developing their ability to analyze, evaluate, and communicate scientific ideas. This suggests that primary school teachers should consider moving beyond traditional lecture-based methods toward more participatory and interactive strategies that foster deeper learning.

Theoretically, the success of the Talking Stick model aligns with constructivist learning theory, which emphasizes that knowledge is actively built through experience, dialogue, and social interaction. The students in this study showed greater critical thinking abilities when they were given the opportunity to engage in questioning, discussion, and reflection during learning. This supports the idea that critical thinking is not a passive skill but must be cultivated through structured classroom experiences that challenge students to think, respond and reason.

Practically, the model offers an accessible, low-cost instructional method that does not require expensive materials or technological tools to implement. Its simplicity and flexibility make it especially suitable for schools with limited resources, yet the outcomes it produces—improvements in critical thinking and academic performance—are significant. Thus, the Talking Stick model can be a valuable option for teachers seeking impactful teaching strategies in a conventional classroom setup.

Finally, from a policy perspective, this study underscores the importance of supporting interactive learning models through teacher training, curriculum development, and education reform. As education systems worldwide, including Indonesia, prioritize the development of higher-order thinking skills, teaching practices must reflect these goals. Models like the Talking Stick should be encouraged and supported through educational policy and professional development programs, ensuring that every student has the opportunity to engage deeply with content and grow as an independent thinker.

5.2 Novelty of the Study

This study presents a novel contribution to elementary science education by empirically examining the effectiveness of the Talking Stick learning model in enhancing critical thinking skills among fourth-grade students, specifically on the topic of energy and forms of energy transformation. Unlike previous research that typically focuses on the Talking Stick model in relation to student motivation or participation, this study uniquely integrates the model with Ennis' critical thinking taxonomy to assess higher-order thinking skills using a validated essay-based instrument. The test items were rigorously evaluated for content, construct, and language validity using Aiken's V coefficient, ensuring that the assessment was age-appropriate and theoretically aligned.

Furthermore, the use of a One-Group Pretest–Posttest Design and analysis of learning gains through the Normalized Gain (N-Gain) method enabled a precise and quantifiable measurement of improvement, with results showing a high average N-Gain score of 0.79. This indicates a significant enhancement in students' critical thinking abilities following the implementation of the Talking Stick model. The novelty also lies in the practical, low-cost nature of the model, which encourages structured verbal interaction, peer collaboration, and reflective questioning—all

essential components for fostering critical thinking in early science learning. Therefore, this study not only reinforces the value of active learning strategies but also offers a replicable, context-sensitive approach for integrating 21st-century skills into primary-level science education.

6. Conclusion

Based on the findings and discussion of this study, it can be concluded that the Talking Stick learning model has a significant and positive influence on the critical thinking skills of fourth-grade students in science learning. This is evidenced by the substantial increase in the average student scores from 44.86 on the pre-test to 88.83 on the post-test, as well as a high N-Gain score of 0.79. These results demonstrate that integrating active and collaborative learning approaches, such as the Talking Stick, enhances students' ability to think logically, analyzes information, and expresses reasoned conclusions.

The Talking Stick model's effectiveness lies in its interactive and student-centered nature, which encourages students to be more engaged, responsible for their learning, and willing to participate in discussions. Through structured turn-taking and oral questioning, students are consistently challenged to reflect, respond critically, and support their ideas with evidence—skills that align with the core components of critical thinking in science.

In addition, the implementation of this model promotes peer collaboration and communication, which not only builds social interaction skills but also reinforces content comprehension. By verbalizing their thoughts and listening to others, students develop a deeper comprehension of scientific concepts and improve their reasoning abilities in a constructive learning environment. In summary, the Talking Stick model is a promising pedagogical approach that elementary school should consider to enhance students' critical thinking in science. Future research is encouraged to explore its application across different subjects, grade levels, and learning contexts to further strengthen its role in improving student learning outcomes

References

- Adiko, H. S. S., & Djafar, M. (2022). Application of the Talking Stick Cooperative Learning Model in Improving Student Learning Outcomes. *Journal La Edusci*, 3(1), 1-5. <https://doi.org/10.37899/journalaeducsci.v3i1.600>
- Ahadia, I. F., Pramono, S. E., & Setiawan, D. (2020). Influences of Talking Stick model assisted by PowerPoint media to primary school students' critical thinking skills. *Educational Management*, 9(1), 42-50. Retrieved from <https://journal.unnes.ac.id/sju/eduman/article/view/37125>
- Ansari, B. I., Junaidi, J., Maulina, S., Herman, H., Kamaruddin, I., Rahman, A., & Saputra, N. (2023). Blended-Learning Training and Evaluation: A Qualitative Study. *Journal of Intercultural Communication*, 23(4), 155-164. <https://doi.org/10.36923/jicc.v23i4.201>
- Arifin, M. B. U., & Laili, D. N. (2022). Pengaruh Model Pembelajaran Kooperatif Tipe Talking Stick terhadap Kemampuan Berpikir Kritis Siswa Kelas 4 pada Mata Pelajaran Matematika. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 7(2), Article 5877. <https://doi.org/10.23969/jp.v7i2.5877>
- Ary, D., Jacobs, L. C., Irvine, C. K. S., & Walker, D. A. (2019). *Introduction to Research in Education* (10th ed.). Boston: Cengage Learning.
- Collins, A., & Stevens, A. L. (1981). *A Cognitive Theory of Interactive Teaching*. Cambridge: Bolt Beranek and Newman Inc.
- Creswell, J. W. (2018). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (6th ed.). Pearson.
- Ennis, R. H. (2011). *The Nature of Critical Thinking: An Outline of Critical Thinking Dispositions and Abilities*. University of Illinois. Retrieved from http://faculty.education.illinois.edu/rhennis/documents/TheNatureofCriticalThinking_51711_000.pdf
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4. <https://doi.org/10.11648/j.ajtas.20160501.11>
- Facione, P. A. (2015). *Critical thinking: What it is and why it counts* (2015 ed.). Insight Assessment.
- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2015). *How to Design and Evaluate Research in Education* (9th ed.). New York: McGraw-Hill Education.
- Hake, R. R. (1999). *Analyzing Change/Gain Scores*. Indiana University. Retrieved from

<http://www.physics.indiana.edu/~hake>

- Halimatussa'diyah, H., Mujasam, M., Widyaningsih, S. W., & Yusuf, I. (2021). Effect of cooperative learning model type of talking stick using simple props to higher-order thinking skill. *Kasuari: Physics Education Journal (KPEJ)*, 1(2), Article 27. <https://doi.org/10.37891/kpej.v1i2.27>
- Herman, H., Shara, A. M., Silalahi, T. F., Sherly, S., & Julyanthry, J. (2022). Teachers' Attitude towards Minimum Competency Assessment at Sultan Agung Senior High School in Pematangsiantar, Indonesia. *Journal of Curriculum and Teaching*, 11(2), 1-14. <https://doi.org/10.5430/jct.v11n2p1>
- Hernandi, A., Warliani, R., & Irvani, A. I. (2024). Improving students' critical thinking skills in physics learning using the Talking Stick model. *JPF (Jurnal Pendidikan Fisika)*, 12(2), 71-90. <https://doi.org/10.24252/jpf.v12i2.50769>
- Johnson, D. W., Johnson, R. T., & Smith, K. A. (2014). Cooperative learning: Improving university instruction by basing practice on validated theory. *Journal on Excellence in College Teaching*, 25(3-4), 85-118.
- Kaharu, S. N., Rahman, A., Pahriadi, P., & Aban, T. A. (2023). The Effect of the Talking Stick Learning Model on Student Learning Outcomes in Science Subject. *Prisma Sains: Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika Dan IPA IKIP Mataram*, 11(3), 916-924. <https://doi.org/10.33394/j-ps.v11i3.7265>
- Nurliyanti, E., & Sari, D. D. (2023). Meningkatkan berpikir kritis, motivasi belajar menggunakan model PBL, Talking Stick, metode Demonstrasi. *Jurnal Pendidikan Sosial dan Konseling*. Retrieved from <https://jurnal.itc.web.id/index.php/jpdsk/article/view/1295>
- Panjaitan, M. B., & Siagian, A. (2020). The Effectiveness of Inquiry Based Learning Model to Improve Science Process Skills and Scientific Creativity of Junior High School Students. *Journal of Education and E-Learning Research*, 7(4), 380-386. <https://doi.org/10.20448/journal.509.2020.74.380.386>
- Panjaitan, M. B., Hamdanah, H., Sirait, J., Sutikno, S., Fatmawati, E., Herman, H., & Mamadiyarov, Z. (2025). The role of emotional regulation in shaping students' perception of physics problemsolving tasks. *TPM – Testing, Psychometrics, Methodology in Applied Psychology*, 32(S2), 1-10. Retrieved from <https://tpmap.org/submission/index.php/tpm/article/view/139>
- Rahmadhani, F. D., Supriyadi, S., Rohman, F., & Rapani, R. (2024). Pengaruh model pembelajaran Talking Stick terhadap kemampuan berpikir kritis peserta didik mata pelajaran IPAS kelas IV Sekolah Dasar. *Lentera: Jurnal Ilmiah Kependidikan*, 17(2), 211-218. <https://doi.org/10.52217/lentera.v17i2.1534>
- Retnawati, H. (2016). Validitas dan Reliabilitas Instrumen Penelitian. *Jurnal Cakrawala Pendidikan*, 35(2), 173-182. <https://doi.org/10.21831/cp.v35i2.8477>
- Siagian, A. F., Ibrahim, M., & Supardi, Z. A. I. (2023). Creative-scientific decision-making skills learning model for training creative thinking skills and student decision making skills. *Nurture*, 17(1), 10-17. <https://doi.org/10.55951/nurture.v17i1.141>
- Slavin, R. E. (1995). *Cooperative learning: Theory, research, and practice* (2nd ed.). Boston: Allyn & Bacon.
- Tamba, R., Sihalohe, E. F., & Purnomo, T. W. (2023) The Influence of the Talking Stick Cooperative Learning Model on Science Learning Outcomes Theme 6 Subtheme 3 in Class V Students at SDN 107400 Bandar Khalipah. *Indonesian Journal of Advanced Research*, 2(6), 707-724. <https://doi.org/10.55927/ijar.v2i6.4551>
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Vygotsky, L. S. (1986). *Thought and language*. MIT Press.
- Yosa, A. & Sundi, V. H. (2021). Pengaruh model pembelajaran Talking Stick pada mata pelajaran matematika terhadap kemampuan berpikir kritis siswa kelas IV. *Pendas: Jurnal Ilmiah Pendidikan Dasar*. <https://doi.org/10.23969/jp.v8i3.10622>

Acknowledgments

Not applicable.

Authors contributions

M.B.P., H.H., and S.S. were responsible for study design and revising. A.F.S., S.D.S. and N.P. were responsible for data collection. M.B.P., A.F.S. and N.P. drafted the manuscript. M.B.P. and Y.K.S. revised the manuscript and H.H., Y.K.S. and S.S. proofread it. All authors read and approved the final manuscript.

Funding

Not applicable.

Competing interests

Not applicable.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Sciedu Press.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

Open access

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.