



# The Effect of Talking Stick Learning Model Assisted by Question Card Media on Junior High School Students' Mathematical Problem-Solving Ability

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**Abstract:** This study investigated the effectiveness of the Talking Stick learning model assisted by Question Card media in enhancing junior high school students' mathematical problem-solving abilities. A quantitative approach with a quasi-experimental design was employed, involving 63 students divided into an experimental and a control group. Data was collected through pretests and posttests, supported by interviews and documentation. The data were analyzed using an independent-samples *t*-test and a one sample *t*-test with SPSS. The results indicated a significant difference in mathematical problem-solving abilities between students taught using the Talking Stick Learning Model assisted by Question Cards and those taught using conventional methods. Furthermore, the mean posttest score of students in the experimental group (79.57) significantly exceeded the Minimum Completion Criteria (KKM) of 70. These findings suggest that the Talking Stick learning model assisted by Question Card media is effective in improving students' mathematical problem-solving abilities.

**Keywords:** Mathematical problem solving ability, Question card, Talking stick

## Introduction

Education is a conscious and systematic effort to create a learning process that enables students to optimally develop their potential, including spiritual, emotional, intellectual, and life skills, beneficial to themselves, society, the nation, and the state (Aithal & Srinivasan, 2024). This is affirmed in Law Number 20 of 2003 concerning the National Education System, which positions education as the primary means of developing the whole Indonesian human being. Education is also viewed as a crucial indicator of a nation's progress, as the quality of education is directly proportional to a country's level of civilization and competitiveness.

One crucial factor in improving the quality of education is the quality of classroom learning. An effective learning process depends not only on teacher professionalism but also on the strategies, methods, and learning media used (Fitrianto, 2024). Teachers are required to be creative in selecting learning approaches that foster motivation, engage students, and create a pleasant learning environment. Without a variety of learning models and media, students tend to be passive, easily bored, and their mathematical problem-solving abilities are suboptimal.

As Munandar (Munandar, 2021) put it, "creativity is the ability to create new combinations based on data, information, or pre-existing elements." This quote emphasizes that teacher creativity is not just about producing something completely new, but also about combining knowledge and methods in an innovative way. In line with this perspective, previous studies (Ladona et al., 2025) have shown that students who perceive mathematics as difficult and monotonous often do so because they believe they lack mathematical ability. In this context, teacher support and instructional practices emerge

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as critical factors in shaping students' attitudes toward mathematics. The ways in which teachers design learning activities, select appropriate instructional models, and foster supportive classroom interactions significantly influence students' confidence and engagement (Ningsih & Widodo, 2024).

Mathematics is a subject that plays a crucial role in developing students' logical, analytical, systematic, critical, and creative thinking skills. At the junior high school level, mathematics instruction aims to equip students with the ability to understand concepts, use reasoning, solve problems, and communicate mathematical ideas effectively. However, observations show that in practice, many students still consider mathematics a difficult and uninteresting subject. This is evident in student scores, which show that only 43.33% achieved the Minimum Competency (KKM), while the remaining 56.67% failed to complete the course. This can be caused by various factors, such as students' low mathematical problem-solving abilities due to the limited variety of learning models and media used by teachers. This condition makes students passive, less confident in expressing their opinions, and less interactive in learning activities. If this continues, the goal of mathematics to equip students with conceptual understanding will not be optimally achieved.

The development of education today faces various challenges, ranging from low student motivation to monotonous teaching methods to increasingly complex curriculum demands (Alias & Abdul Razak, 2023). These conditions require teachers to not only carry out routine learning but also to be able to present more varied and meaningful strategies. To overcome these problems, innovation in the learning process is needed. This is in line with Schumpeter (1983) view that "innovation is the creation of new combinations that bring about change." Thus, innovation in education means presenting new methods that can improve the quality of learning.

In addition, Joyce & Showers (2002) explain that "innovative learning requires teachers to be able to select, modify, and integrate various learning models according to the classroom context." This view emphasizes that innovation is not only the use of technology, but also the teacher's ability to modify methods, develop creative media, and create a learning environment that supports active student involvement.

To address this issue, innovation in the learning process is needed. One alternative is the implementation of the Talking Stick learning model, a cooperative model that uses sticks to signal turn-taking. This model encourages students to be active, confident in expressing their opinions, and engaging in group discussions. Talking Stick not only emphasizes cognitive aspects but also develops communication skills and self-confidence (Kurniasih & Sani, 2015). Furthermore, a fun learning environment will motivate students to understand the material.

Effective learning requires active student involvement through varied and engaging strategies. One cooperative learning model that can create an interactive learning environment is Talking Stick. This model encourages students to participate in turns in expressing their opinions, thereby increasing courage, self-confidence, and communication skills. However, implementing the Talking Stick learning model requires the support of appropriate learning media to be more effective. This is in line with the opinion of Heinich et al. (2002), who stated that "the right media can clarify messages, attract attention, and improve the quality of interactions in learning."

Implementing the Talking Stick learning model requires the support of appropriate learning media to be more effective. One such tool is the Question Card, a card containing questions related to the subject matter. Using Question Cards can foster a sense of responsibility, foster healthy competition, and encourage students to think critically when

answering questions (Ahmad, 2025). This tool is relatively easy to create, inexpensive, and practical to use, yet it can increase student engagement in the learning process. Talking stick can be done during or at the end of learning process.

Several previous studies support the effectiveness of Talking Stick on learning outcomes. Research conducted by Junistira (2022) showed that using the Talking Stick model can increase students' activeness and critical thinking skills in solving mathematics problems compared to the lecture method. Similar results were also found that learning using the Talking Stick model can create a fun and interactive learning environment, enabling students to more easily understand concepts and improve their problem-solving skills (Rahayu et al., 2019).

In addition, research by Surbakti & Chantrin (2025) concluded that the activity of taking turns using sticks in the Talking Stick model gives all students the same opportunity to think, express opinions, and answer questions, thus having a positive impact on their mathematical problem-solving abilities. This requires good planning, implementation, and evaluation. In line with Mulyanti & Yunizha (2024) stated that the stages of classroom action research include planning (plan), implementation (act), observation (observe), and reflection (reflect).

Based on the description, it can be concluded that there is a real problem related to low mathematical problem-solving ability caused by the use of learning models and media that are less varied. This research gap is important to fill by testing the application of the Talking Stick model assisted by Question Card media as an effort to improve students' mathematical problem-solving ability. The novelty of this research is expected to contribute to the development of innovative learning strategies that not only improve academic achievement, but also the ability to understand concepts, use reasoning, solve problems, and communicate mathematical ideas effectively.

## Method

In this study, the researcher used a quantitative approach. Quantitative approach is a research method based on the philosophy of positivism, used to examine a specific population or sample using a generally random sampling technique (Sugiyono, 2020). Quantitative research data is numerical, analyzed using statistical methods, and aims to test predetermined hypotheses. This approach was chosen based on the characteristics of the object of study, namely student learning outcomes expressed in the form of values or numbers. The numerical data were then analyzed using statistical techniques to objectively determine the effect of the Talking Stick Learning Model assisted by Question Card Media on students' mathematical problem-solving abilities. Thus, the research results are expected to provide a measurable and generalizable empirical picture.

The research methodology used was the Quasi-Experimental method. Experimental research is a research method used to determine the effect of a particular treatment on other variables under controlled conditions (Sugiyono, 2020). Quasi-experiments are part of the experimental method but do not fully meet the criteria for pure experiments, particularly in terms of determining the control group, which is not randomly selected. However, this method still allows researchers to determine the cause-and-effect relationship of the treatment given. This study used a Non-Equivalent Control Group Design, which is a design that compares two groups: the experimental class given treatment in the form of the application of the Talking Stick learning model assisted by Media Question Cards, and the control class that uses conventional learning. Both groups were given a pretest before the treatment, and a posttest after the treatment, then the results were compared to see the improvement in learning outcomes that occurred.

The population in this study was 90 junior high school students, divided into three classes: 35 students in class A, 27 in class B, and 28 in class C. The research sample was then determined. The research sample was determined using a cluster sampling technique. Through this technique, the researcher selected two representative classes: one class as the experimental group and one class as the control group, ensuring that the research sample still reflected the characteristics of the population.

In terms of data collection, this study used a test technique. According to Djemari (2008), a test is a tool to indirectly measure a person's abilities through responses to stimuli or questions. The test in this study consisted of multiple-choice questions with true or false answers, structured based on indicators of mathematics learning outcomes for grade 9. The test was administered twice: before treatment (pretest) and after treatment (post test), to both the experimental and control groups. The test instrument was developed through three stages: constructing a grid matrix containing the relationships between learning outcomes, indicators, item numbers, and cognitive ability levels; arranging the items according to the grid; and the development of assessment guidelines that determine scores and assessment criteria. With this instrument, researchers can measure the extent to which the Talking Stick Learning Model, supported by Question Card Media, has a valid, objective, and reliable impact on students' mathematical problem-solving abilities. Furthermore, the authors used interview and documentation collection techniques as supporting data collection.

In this study, an instrument capable of accurately measuring students' mathematical problem-solving abilities was required. Therefore, before the instrument was used for data collection, validity and reliability tests were conducted. Validity tests aimed to ensure that each item presented adequately represented the aspect of problem-solving ability being measured, while reliability tests were conducted to ensure that the instrument provided consistent and stable results. Through these two procedures, the quality of the instrument was ensured, ensuring that the data obtained in this study had a high level of accuracy and reliability.

Data analysis in this study began with a normality test to ensure normal distribution, using the Kolmogorov–Smirnov test. Next, a homogeneity test was performed using Levene's Test to determine whether the variance between groups was homogeneous.

After the parametric assumptions were met, the data were analyzed using a One-Sample T-test to compare the sample mean with a specific reference value. Additionally, an Independent Samples t-test was used to determine the difference in means between two unrelated groups. Significant decisions were made based on a p-value <0.05.

## Result and Discussion

This study aims to determine the effect of the Talking Stick learning model assisted by Question Card media on students' mathematical problem-solving abilities. The data analyzed were obtained from 63 students divided into two groups: the experimental group and the control group.

Table 1. Descriptive statistical data

Description	N	Mean	Std. Deviation	Minimum	Maximum
Experimental class	35	79,57	6,199	70	90
Control class	28	51,61	5,737	42	63

**Table 1** summarizes the descriptive statistics of students' mathematical problem-solving scores. The experimental class ( $N = 35$ ) obtained a higher mean score ( $M = 79.57$ ,  $SD = 6.199$ ), with scores ranging from 70 to 90, compared to the control class ( $N = 28$ ), which recorded a mean score of 51.61 ( $SD = 5.737$ ) and scores ranging from 42 to 63. Overall, the experimental class demonstrated higher performance than the control class. The experimental group was taught using the Talking Stick model, using Question Cards. The learning process began with introductory activities, in which the teacher opened the lesson with a greeting, prayer, apperception, and presentation of the learning objectives. This preliminary activity is important because it serves as an orientation phase that prepares students mentally and focuses on learning activities. This aligns with Hamalik's (2011) opinion, which states that "effective learning must begin by creating conditions for students to be physically, mentally, and socially ready to participate in learning activities".

Next, the teacher presented the main topic "Space Structures" concisely and clearly, and then instructed students to sit in a circle. During the Talking Stick model, students took turns passing the stick while singing a song. When the teacher said "stop," the student holding the stick was asked to draw a question card and answer the question written in front of their peers. The teacher then provided clarification and reinforcement for the answers given. At the end of the lesson, the teacher and students summarized the material, provided feedback, and closed the learning activity.

According to Santoso(2014), "normality testing is an important stage in quantitative data analysis that aims to determine whether the collected data comes from a normally distributed population or not." If the data meets this assumption, then hypothesis testing can be carried out with a method that is more robust and sensitive to differences between groups. Normality testing is the initial step before further analysis. Based on the Kolmogorov-Smirnov test, a significance value of  $0.200 > 0.05$  was obtained. Thus, the normality assumption is met, so it can be concluded that the data on mathematical learning abilities of students in the control class and the experimental class are normally distributed.

The homogeneity test further aims to determine whether the variance (distribution) of the data from two or more groups is equal. A significance value of  $0.560 > 0.05$  indicates that  $H_0$  is accepted, indicating that the learning outcomes of students in the control and experimental classes are homogeneous.

Table 2. Output Hasil Uji One Sample t Test

t	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
			Lower	Upper
9,134	,000	9,571	7,44	11,70

Based on the results of the One Sample t-Test on the posttest scores of the experimental class students (table 2), a significance value of  $0.000 < 0.05$  was obtained. Thus,  $H_0$  was rejected and  $H_1$  was accepted.

The results of the One Sample t-test analysis show that the p value = 0.000, so it can be concluded that the average student score is significantly different from the established mastery criteria, namely 70. The correct interpretation of this conclusion is that the average student score of 79.57 is proven to be significantly higher than the mastery standard, thus indicating learning outcomes that exceed the minimum criteria.

According to Sugiyono (2020) "the One Sample t-Test is used to test whether the mean of a sample differs significantly from the population mean or a specific predetermined value." In this context, a significance value less than 0.05 indicates a significant difference

between the average student learning outcomes and the Minimum Competency (KKM) as the standard for learning success.

Furthermore, Sekaran & Bougie(2016) explain that "rejection of  $H_0$  indicates sufficient statistical evidence to accept the alternative hypothesis, meaning that the treatment provided had a significantly different effect." Therefore, the use of the Talking Stick model with Question Card media has proven effective in improving students' mathematical problem-solving skills in the experimental class.

The Independent Sample t-Test was applied to determine the significance of the mean difference between the two groups. The assessment criteria for the Independent Sample t-test refer to the p-value. A p-value  $<0.05$  indicates that the mean difference between groups is statistically significant. Conversely, a p-value  $\geq 0.05$  indicates that the difference found is not significant.

The Independent Sample t-Test output was used as the basis for decision-making on the hypothesis. If the significance value (Sig. 2-tailed) on the output  $> 0.05$ , then  $H_0$  was accepted and there was no significant difference between the average learning outcomes of the two groups (experimental class and control class). Conversely, if the significance value  $<0.05$ , then  $H_1$  was accepted, which means there was a significant difference between the average learning outcomes of the two groups. Based on the results of the Independent Sample t-Test, the significance value (Sig. 2-tailed) was  $0.000 < 0.05$ , so  $H_0$  was rejected and  $H_1$  was accepted. This means there is a significant difference between the mathematical problem-solving abilities of students in the experimental class who used the Talking Stick Learning Model with Question Cards and those in the control class who used conventional methods.

An Independent Sample t-Test was applied to determine the significance of the difference in means between the two groups, namely the experimental class and the control class. This test was used to determine whether there was a statistically significant difference in mathematical learning abilities between students who received the Talking Stick Learning Model with Question Cards and students who received conventional learning.

According to Santoso (2014) "the Independent Sample t-Test is used to compare the means of two unrelated or independent groups, with the aim of determining whether there is a significant difference between them." Furthermore, Ghozali (2018) added that "this t-test is most appropriate when the data is normally distributed and the variances of both groups are homogeneous." Thus, this test provides a strong basis for concluding whether the learning treatment has a significant impact on student learning outcomes.

The success of learning activities can be measured by students' mathematical problem-solving abilities. Therefore, educators must be prepared and equipped to improve students' mathematical problem-solving abilities. Furthermore, the learning model implemented by educators influences student success. Varied learning models and media throughout the learning process will create an engaging and enjoyable learning environment, which in turn can improve students' mathematical problem-solving abilities. The learning models and media employed by educators significantly determine the quality of learning. In this study, researchers used the talking stick learning model. It is hoped that students' mathematical problem-solving abilities will improve and meet the school's maximum completion standard (KKM).

Based on posttest results after learning in the control class using conventional methods and in the experimental class using the talking stick learning model with question cards, the lowest scores were 42 for the control class and 70 for the experimental class, respectively. Meanwhile, the highest score achieved in the control class was 63 and in the

experimental class was 90. From these results, it can be concluded that learning with the talking stick model in the experimental class was able to improve students' mathematical problem-solving abilities.

The trial results showed a difference in the mathematical problem-solving abilities of students in the experimental class who were treated using the Talking Stick Learning Model with Question Cards compared to students in the control class who were treated using conventional methods. This indicates that the use of media-based cooperative learning models can improve student participation and critical thinking skills.

According to Slavin (2012), "cooperative learning models can significantly increase student engagement, higher-order thinking skills, and learning outcomes compared to traditional learning." Furthermore, Fitrianto (2024) emphasized that "the use of relevant and innovative learning media in cooperative models, such as question cards, can motivate students, clarify material, and improve problem-solving skills."

Therefore, this difference in learning outcomes confirms the effectiveness of the Talking Stick model with Question Cards in improving students' mathematical problem-solving abilities compared to conventional methods, both in terms of activeness, participation, and conceptual mastery.

The results of the Independent Sample t-Test prove that there is a significant difference between the mathematical problem-solving abilities of students in the experimental and control classes, with a significance value of  $0.000 < 0.05$ . The average mathematical problem-solving ability of students in the experimental class was 79.57, significantly higher than that of the control class, which was only 51.61. This confirms that the use of the Talking Stick learning model with Question Cards is more effective than the conventional learning method still used in the control class. This finding aligns with research by Usrawati & Wahyudi (2020) which supports this finding, which found that in mathematics (the concept of addition), the Talking Stick model effectively improves learning outcomes, student activity, and student responses compared to conventional methods.

Their research results showed that media combined with the Talking Stick model promoted better understanding of the materia (Ali et al., 2024). Furthermore, several students stated that this method prevented drowsiness, improved focus, and enabled them to grasp the material more quickly. Students also reported that the questions on the Question Cards helped them recall the material quickly. They felt like they were learning while playing, which brought the classroom atmosphere to life.

The results of the test showed the average mathematical problem-solving ability of ninth-grade experimental students after being treated using the Talking Stick Learning Model with Question Card Media. Furthermore, the results of the One Sample t-Test in this study showed that the average mathematical problem-solving ability of experimental class students after treatment (79.57) was significantly higher than the Minimum Completion Criteria (KKM), which was 70, with a significance value of  $0.000 < 0.05$ . Research by Tati et al. (2022) also found that using the Talking Stick model can significantly improve student learning outcomes, exceeding the minimum standards set by the school. This reinforces the model's suitability for use in improving learning outcomes beyond the KKM. Furthermore, most students reported that learning using the Talking Stick model, supported by Question Cards, felt enjoyable and different from usual. They felt more enthusiastic about participating in the lesson because the learning process was active and involved all students. In implementing the Talking Stick learning model supported by Question Cards, researchers found supporting and inhibiting factors. Consistent with previous research (Ningsih et al., 2025), effective learning occurs when

teachers and students engage in continuous interaction through guidance, feedback, and reflective communication. Collaborative interactions enable teachers to identify students' difficulties, respond to anxiety during learning activities, and adjust instructional practices accordingly. Teacher–student interactions during transitions between small-group and whole-class activities play an important role in maintaining student engagement and supporting the development of sociomathematical norms. Such supportive interactions help create a learning environment in which students feel encouraged to participate actively and confidently in classroom discussions.

One supporting factor was that students became more active during the learning process. This was evident in each student holding the stick having to take a question card and answer the question. In this way, students who were initially shy or lacked confidence in answering or expressing opinions became more confident in speaking up and actively participating in the learning process. Another inhibiting factor in using the Talking Stick learning model supported by Question Cards was that it made students feel anxious or nervous, as they would feel nervous when the stick approached or fell towards them. According to Ningsih (2023), this condition is consistent with social cognitive theory, which emphasizes that the surrounding learning environment plays a crucial role in supporting or inhibiting students' learning processes. Furthermore, the limited implementation time was also a constraint, as this model was not effective if only used once or twice; it needed to be repeated several times so that most students had the opportunity. Another obstacle was the tendency of this model to favor more intelligent students. If the stick fell on less able students, they often struggled to answer, in contrast to intelligent students who could answer questions easily.

## Conclusion

This study demonstrates that the Talking Stick learning model assisted by question cards has a significant positive effect on junior high school students' mathematical problem-solving skills. The findings indicate that students who received the intervention achieved an average post-test score of 79.57, exceeding the school's Minimum Completion Criteria (KKM) of 70. This result suggests that the model effectively enhances students' understanding of mathematical concepts and supports the achievement of learning objectives, particularly in problem-solving contexts.

Nevertheless, the findings should be interpreted with caution due to several limitations. The study was conducted in a single junior high school, which limits the generalizability of the results. In addition, the intervention was implemented over a relatively short duration, making it difficult to capture the long-term impact of the learning model. External variables were not fully controlled, and students' problem-solving abilities were measured solely through written tests, which may not adequately reflect deeper cognitive processes or collaborative interactions. Moreover, although the Talking Stick model emphasizes student interaction, group dynamics were not systematically examined.

Based on these considerations, future research is encouraged to involve broader samples and longer implementation periods, incorporate multiple assessment instruments, and analyze social interactions within learning groups. Comparative studies with other instructional models are also recommended to further evaluate the effectiveness and applicability of the Talking Stick learning model assisted by question cards in diverse educational settings.

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## Author Contribution

Author 1: Conceptualization, Writing - Original Draft, Editing and Visualization; Author 2: Writing – Methodology; Field Implementation

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