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Enhancing Biology Learning Outcomes Through The Talking Stick Model Assisted by Choose Number Media: A Classroom Action Research

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Abstract

This study investigates the effectiveness of the Talking Stick learning model assisted by Choose Number media in improving student learning outcomes, activities, and responses in biology education on ecosystem topics. A Classroom Action Research (CAR) design was employed across three cycles at SMPN 2 Soko, Tuban, Indonesia, involving 34 seventh-grade students. Data collection instruments included student and teacher activity observation sheets, learning outcome tests, and student response questionnaires. Da ta were analyzed using descriptive statistical techniques. Results demonstrated progressive improvements across cycles. Student activity scores increased from 2.25 (Cycle I) to 2.8 (Cycle II) and 3.4 (Cycle III) on a 4 - point scale. Teacher activity scores improved from 2.1 to 2.65 and 3.2, respectively. Classical learning mastery increased significantly from 64.71% (Cycle I) to 88.23% (Cycle II) and reached 94.12% (Cycle III). Student response questionnaires indicated 89.7% positive responses. The findings suggest that the Talking Stick model with Choose Number media effectively promotes student active participation, improves teacher performance, and increases learning mastery. This research contributes empirical evidence supporting the integration of cooperative learning models with game-based media to enhance biology learning outcomes.

Keywords:Talking Stick learning model; Choose Number media; learning outcomes; classroom action research; biology education

1. Introduction

Education and scientific development represent strategic steps in preparing students oriented toward future development and capabilities. Education aims to shape human character and wise behavior across various activities. Therefore, education must receive serious attention to achieve its goals. Schools as educational institutions serve as venues where learning processes occur (Kusumah & Dwitagama, 2009). Issues may arise including conceptual misunderstandings in learning materials, classroom learning design and strategy usage, utilization of teaching aids, media, and learning resources, as well as problems in implementing learning evaluation systems.

The quality of education remains a central focus in Indonesia's educational development agenda. Efforts to enhance educational quality can be achieved through various means, including improving educator quality, professional training, and enabling

educators to solve learning problems professionally through controlled research activities (Aqib, 2009; Susilo, 2009). As professionals, teachers are expected not only to execute their primary duties of educating and guiding students but also to initiate learning improvements through research. Teachers must be able to innovate in learning to improve educational quality (Sa'ud, 2008; Wina, 2008).

In the learning process, teachers play a crucial role as they interact most frequently with students. However, biology learning in many schools remains conventional, lacking variation in teaching methods (Slameto, 2003). Several classroom problems persist: (1) students show minimal interest in biology; (2) students remain passive during learning processes; (3) students frequently cause disturbances; (4) students lack concentration; (5) students demonstrate unwillingness to complete assignments; and (6) low biology learning outcomes. These problems result in learning outcomes that have not achieved expected standards (Hamalik, 2004; Purwanto, 2008).

The core problem underlying these issues is the monotonous application of learning models without variation. Learning models consist of various types, each with advantages and disadvantages (Suprijono, 2009; Huda, 2011). One alternative learning model to address these problems is the active Talking Stick learning model with Choose Number media.

The Talking Stick model, originally used by Native Americans to facilitate equitable speaking opportunities in forums (Carol Locust, as cited in Widodo, 2009), requires students to be active and prepared to answer questions. This model is expected to increase student motivation and improve learning outcomes (Aini, 2010; Tunas, 2012). To provide innovation making students more active and interested in learning, additional media is needed. Choose Number media, resembling a lottery containing numbers from which students select questions without prior knowledge (Yuningsih, 2012; Sufanti, 2010), was selected by researchers to collaborate with the Talking Stick method.

Previous studies have supported the effectiveness of this approach. Safitri et al. (2018) found that the Talking Stick model with Choose Number media significantly influenced biology learning outcomes, with experimental class post-test scores (79.50) exceeding control class scores (71.74). Iftitah (2022) reported that the combination of the Talking Stick model with other cooperative learning strategies increased student activities from 38% to 87%. Similarly, Arganingtias (2023) demonstrated that the Talking Stick model with Choose Number media significantly affected both cognitive and affective learning outcomes. Syahputri (2022) also found significant differences between experimental and control classes using this model. Ma'rifah (2013) reported that the Talking Stick model with media support positively influenced student motivation.

Cooperative learning, which forms the theoretical foundation of the Talking Stick model, is defined by Davidson and Warsham (in Isjoni, 2011) as teaching and learning activities in small groups where students learn and work together to achieve both individual and group learning experiences. According to Roger and David Johnson, five essential elements characterize cooperative learning: positive interdependence, face-to-face promotive interaction, individual accountability, interpersonal skills, and group processing (Lie, 2004; Sugiyanto, 2010).

Learning outcomes represent behavioral changes occurring in individuals after learning experiences, transforming from ignorance to knowledge and from incomprehension to understanding (Hamalik, 2006). According to Bloom's taxonomy, learning outcomes are

categorized into three domains: cognitive, affective, and psychomotor (Purwanto, 2008; Krathwohl, 1974).

This study aims to: (1) determine student activities during Talking Stick learning with Choose Number media on ecosystem topics; (2) determine teacher activities during implementation of the model; (3) determine whether the model can improve student learning outcomes; and (4) identify student responses to biology learning using this model.

2. Research Methods

2.1. Research Design

This study employed Classroom Action Research (CAR) using the Kemmis and McTaggart model (Arifin, 2008; Arikunto, 2003), comprising four stages per cycle: (1) planning, (2) action implementation, (3) observation, and (4) reflection. The research was conducted over three cycles from March to August 2015.

2.2. Research Setting and Participants

The study was conducted at SMPN 2 Soko, Tuban, East Java, Indonesia, during the 2014/2015 academic year. Participants included 34 seventh-grade students (VII A) comprising 16 male and 18 female students selected through purposive sampling based on identified learning problems.

2.3. Research Procedures

Cycle I focused on ecosystem components (biotic and abiotic elements). Learning activities included teacher presentations, group formation (4-5 students per group), Talking Stick implementation with singing accompaniment, question-answer sessions, and post-test evaluation.

Cycle II addressed ecosystem units (individuals, populations, communities, habitats, population density, niches). Improvements included better time management, enhanced classroom control, and varied songs.

Cycle III covered food chains, food webs, and energy pyramids. Additional implementation included student response questionnaires.

2.4. Data Collection Instruments

Four instruments were used in this study. First, student observation sheets measured student activities during learning using 10 indicators scored on a 1-4 scale (1=Poor, 2=Fair, 3=Good, 4=Very Good). Second, teacher observation sheets measured teacher performance using 10 indicators scored on the same 1-4 scale. Third, learning outcome tests assessed cognitive achievement using 20 multiple-choice questions per cycle. Fourth, student response questionnaires measured student perceptions using 10 items with "Yes/No" responses.

Test instruments were validated using Pearson product-moment correlation. Reliability was calculated using the Spearman-Brown formula (Arikunto, 2003). The validity criteria followed Arikunto's (2002) classification: 0.00-0.20 (very low), 0.21-0.40 (low), 0.41-0.70 (sufficient), 0.71-0.90 (high), 0.91-1.00 (very high). Reliability criteria followed Sugiyono (2004): 0.8-1.0 (very high), 0.6-0.8 (high), 0.4-0.6 (sufficient), 0.2-0.4 (low), 0.00-0.2 (very low).

2.5. Data Analysis Techniques

Activity data were analyzed using the formula: $Xi = (P1i + P2i) / 2$ and $Ti = (Xi / N) \times 100\%$, where Xi is the frequency of activity for indicator i, P1i and P2i are observer scores, and N is the total activities (Kusairi in Setyo, 2006). The criteria classification was: $00.00\% \leqslant Ti \leqslant 13.55\%$ (Poor), $13.64\% \leqslant Ti \leqslant 22.64\%$ (Fair), $22.73\% \leqslant Ti \leqslant 31.73\%$ (Good), and $31.82\% \leqslant Ti \leqslant 36.36\%$ (Very Good).

For learning mastery, individual mastery required a score $\geqslant 75$ (school KKM standard). Classical mastery was calculated as (number of students achieving mastery / total students) $\times$ 100% (Krisnawati, 2006 in Safi'i, 2010). The average score was calculated as $\bar{x} = \Sigma x / \Sigma N$, where $\bar{x}$ is the average, Σx is the sum of all student scores, and ΣN is the number of students. The success indicator was classical mastery $\geqslant$ 80%.

Response questionnaire data were analyzed using the formula $P = (F / N) \times 100\%$, where P is the percentage, F is the frequency of "Yes" responses, and N is the total respondents (Utomo in Kundari, 2008). The positive response criterion was $P \geqslant 75\%$.

3. Results and Discussion

3.1. Pre-Action Stage Results

Initial observation revealed that conventional teacher-centered learning predominated, with minimal student interaction. Pre-action learning outcomes showed only 16 students (47.05%) achieved mastery (score $\geqslant$ 75), with an average score of 69.85 (minimum 30, maximum 100), indicating the need for intervention. These findings confirm the problems identified by Slameto (2003) regarding passive student participation and low learning outcomes in conventional learning settings.

3.2. Cycle I Results

Student activities in Cycle I achieved an average score of 2.25 (Fair category). Students demonstrated preparedness (2.5), curiosity (2.5), and attentiveness to learning objectives (3.0). However, aspects requiring improvement included serious attention to learning steps (2.0) and answering questions (2.0). These results align with findings by Iftitah (2022), who reported that initial implementation of cooperative learning models requires adaptation time for students.

Teacher activities in Cycle I achieved an average score of 2.1 (Fair category). Strengths included informing learning objectives (2.5) and guiding reading activities (2.5). Weak areas included providing motivation (2.0) and evaluation (2.0). This reflects the

challenges identified by Aqib (2009) regarding teacher readiness in implementing innovative learning models.

Learning outcomes in Cycle I showed an average score of 80.44 with 22 students (64.71%) achieving mastery. This did not meet the 80% classical mastery indicator. Table 1 presents the summary of Cycle I learning outcomes.

Table 1. Summary of Learning Outcomes Cycle I

Description	Value
Students achieving mastery (KKM ≥ 75)	22 students
Highest score	100
Students not achieving mastery (KKM < 75)	12 students
Lowest score	45
Classical mastery	64.71% (Not achieved)
Average score	80.44

3.3. Cycle II Results

Student activities in Cycle II increased to an average score of 2.8 (Good category). Improvements were observed in all indicators, particularly listening to learning objectives (3.5 - Very Good) and answering questions (3.0). This improvement supports the findings of Safitri et al. (2018), who reported that repeated implementation of the Talking Stick model enhances student engagement.

Teacher activities in Cycle II increased to an average score of 2.65 (Good category). Notable improvements were observed in informing learning objectives (3.5) and providing questions (3.0). These results are consistent with Susilo's (2009) assertion that CAR enables systematic improvement of teaching practices through reflection and revision between cycles.

Learning outcomes in Cycle II showed an average score of 87.06 with 30 students (88.23%) achieving mastery. Classical mastery exceeded the 80% success indicator. Table 2 presents the summary of Cycle II learning outcomes.

Table 2. Summary of Learning Outcomes Cycle II

Description	Value
Students achieving mastery (KKM ≥ 75)	30 students
Highest score	100
Students not achieving mastery (KKM < 75)	4 students
Lowest score	65
Classical mastery	88.23% (Achieved)
Average score	87.06

3.4. Cycle III Results

Student activities in Cycle III reached an average score of 3.4 (Very Good category). Significant improvements were observed in student preparedness (4.0), serious attention to learning steps (4.0), and answering questions (4.0). These findings align with Arganingtias (2023), who demonstrated that optimal implementation of the Talking Stick model with Choose Number media produces very good student activity levels.

Teacher activities in Cycle III reached an average score of 3.2 (Very Good category). All indicators achieved Good to Very Good ratings, with informing learning objectives reaching 4.0. This confirms the professional competence development emphasized by Sa'ud (2008) and Wina (2008) regarding teacher capacity to innovate in learning.

Learning outcomes in Cycle III showed an average score of 88.67 with 32 students (94.12%) achieving mastery. Table 3 presents the summary of Cycle III learning outcomes.

Table 3. Summary of Learning Outcomes Cycle III

Description	Value
Students achieving mastery (KKM ⩾ 75)	32 students
Highest score	100
Students not achieving mastery (KKM < 75)	2 students
Lowest score	65
Classical mastery	94.12% (Achieved)
Average score	88.67

3.5. Student Response Questionnaire Results

The student response questionnaire revealed overwhelmingly positive responses to the Talking Stick model with Choose Number media. Table 4 presents the complete results.

Table 4. Student Response Questionnaire Results (N=34)

No.	Statement
1	The Talking Stick model with Choose Number media increases interest in the material
2	The Talking Stick model with Choose Number media is very enjoyable
3	This learning model increases activeness in learning
4	This model increases liking for biology
5	The Talking Stick model is easy to implement, making material easily understood
6	The Talking Stick model trains cooperation
7	This model increases learning enthusiasm

8	This model facilitates communication with peers and teachers
9	This model increases courage to ask questions
10	This model makes evaluation easier

The average positive response rate of 89.7% (exceeding the 75% criterion) indicates strong student acceptance. The highest approval (97.05%) was for increased learning enthusiasm, followed by increased liking for biology (94.11%). These findings align with Ma'rifah (2013), who reported that the Talking Stick model with media support positively influenced student motivation, and with Syahputri (2022), who found significant positive student responses to this learning model.

3.6. Summary of Improvements Across Cycles

Table 5 presents the comparative improvement across all three cycles.

Table 5. Summary of Improvements from Cycle I to Cycle III

Indicator	Cycle I	Cycle II	Cycle III
Student Activities (average)	2.25	2.8	3.4
Student Activities Criteria	Fair	Good	Very Good
Teacher Activities (average)	2.1	2.65	3.2
Teacher Activities Criteria	Fair	Good	Very Good
Average Learning Score	80.44	87.06	88.67
Classical Mastery	64.71%	88.23%	94.12%
Classical Mastery Status	Not Achieved	Achieved	Achieved
Student Positive Response	-	-	89.7%

4. Discussion

Improvement in Student Activities: The progressive increase in student activities from 2.25 (Cycle I) to 3.4 (Cycle III) demonstrates that the Talking Stick model with Choose Number media effectively promotes active student participation. This finding is consistent with previous research by Iftitah (2022), who reported that the combination of the Talking Stick model with other cooperative learning strategies increased student activities from 38% to 87%. Similarly, Safitri et al. (2018) found that the Talking Stick model with Choose Number media significantly improved biology learning outcomes.

The active involvement of students in group discussions, answering questions, and providing counter-arguments reflects the model's success in creating a student-centered learning environment. According to cooperative learning theory (Isjoni, 2011; Huda, 2011), elements such as positive interdependence and face-to-face promotive interaction enhance student engagement. The use of songs during stick rotation added an element of enjoyment, reducing learning monotony as suggested by Suprijono (2009) regarding the importance of varied learning strategies.

Improvement in Teacher Activities: Teacher activity scores improved from 2.1 (Cycle I) to 3.2 (Cycle III), indicating enhanced professional competence in implementing innovative learning models. Initial challenges in time management and classroom control were addressed through reflection and revision between cycles. By Cycle III, teachers demonstrated Very Good performance across all indicators, including providing apperception, motivation, and effective evaluation.

These findings support Aqib's (2009) assertion that CAR enables teachers to systematically improve their instructional practices. The collaborative reflection process between cycles allowed identification of weaknesses and implementation of targeted improvements, consistent with Susilo's (2009) emphasis on the reflective nature of CAR. The improvement also aligns with Sa'ud (2008) and Wina's (2008) perspectives on teacher professional development through continuous learning innovation.

Improvement in Learning Outcomes: The increase in classical mastery from 64.71% (Cycle I) to 94.12% (Cycle III) demonstrates the model's effectiveness in improving cognitive learning outcomes. This finding is consistent with previous studies. Arganingtias (2023) reported that the Talking Stick model with Choose Number media significantly influenced cognitive and affective learning outcomes, with experimental class post-test scores (79.50) exceeding control class scores (71.74). Syahputri (2022) similarly found significant differences between experimental and control classes using this model.

The improvement can be attributed to several factors based on learning theory (Slameto, 2003; Hamalik, 2004). First, the Talking Stick model creates a sense of responsibility as students never know when they might receive the stick. Second, the Choose Number media adds an element of surprise and gamification, increasing student motivation. Third, group discussion before answering allows collaborative knowledge construction. Fourth, immediate feedback from teachers reinforces correct understanding, supporting the principles of effective learning evaluation (Purwanto, 2008).

The 94.12% mastery rate achieved in Cycle III exceeds the 80% success indicator, confirming that the intervention successfully addressed the initial problem of low learning outcomes. According to Bloom's taxonomy (Purwanto, 2008), students demonstrated achievement across cognitive levels from knowledge (C1) to evaluation (C6) as reflected in the post-test questions.

Student Responses: The average positive response rate of 89.7% indicates strong student acceptance. This exceeds the 75% criterion established for positive responses. The highest approval (97.05%) was for increased learning enthusiasm, followed by increased liking for biology (94.11%). These findings align with Ma'rifah (2013), who reported that the Talking Stick model with media support positively influenced student motivation, and with Aini (2010), who found increased student activity using this model.

The positive responses can be explained by the model's novelty compared to conventional lecture methods. The game-like elements (lottery-style question selection, singing during stick rotation) created an enjoyable atmosphere, reducing the perception of biology as a difficult and boring subject. According to Tunas (2012), the Talking Stick model's success in increasing student interest stems from its ability to create a relaxed yet focused learning atmosphere.

Integration with Theoretical Framework: The findings strongly support cooperative learning theory (Isjoni, 2011; Huda, 2011). The five essential elements of cooperative

learning were evident: positive interdependence, face-to-face promotive interaction, individual accountability, interpersonal skills, and group processing. The success also validates Suprijono's (2009) assertion that the Talking Stick model effectively combines individual responsibility with collaborative learning.

Limitations of the Study: Several limitations should be acknowledged. First, the study was conducted at a single school with a specific sample size (34 students), limiting generalizability. Second, the research duration was relatively short (three cycles). Third, the study focused primarily on cognitive outcomes, with limited measurement of affective and psychomotor domains. Fourth, the Choose Number media required preparation time that might challenge implementation in time-constrained settings..

5. Conclusion

Based on the research findings and discussion, the following conclusions can be drawn. First, student activities progressively improved through the implementation of the Talking Stick model with Choose Number media, from Fair (2.25 or 22.5%) in Cycle I to Good (2.8 or 28%) in Cycle II, and Very Good (3.4 or 34%) in Cycle III. The model successfully promoted active student participation in group discussions, question answering, and collaborative learning.

Second, teacher activities demonstrated continuous improvement from Fair (2.1 or 21%) in Cycle I to Good (2.65 or 26.5%) in Cycle II, and Very Good (3.2 or 32%) in Cycle III, indicating enhanced professional competence in implementing innovative, student-centered learning models.

Third, learning outcomes showed significant improvement, with classical mastery increasing from 64.71% (Cycle I) to 88.23% (Cycle II) and reaching 94.12% (Cycle III), exceeding the 80% success indicator. Average scores improved from 80.44 to 87.06 to 88.67.

Fourth, student responses were overwhelmingly positive, with 89.7% of students expressing favorable perceptions of the Talking Stick model with Choose Number media. The model increased learning enthusiasm (97.05%), biology interest (94.11%), active participation (91.18%), and cooperation skills (91.18%).

The Talking Stick learning model assisted by Choose Number media effectively addresses the problems of low student activity and learning outcomes in biology education on ecosystem topics for seventh-grade students. For teachers, this model can serve as an alternative instructional strategy. Teachers should carefully manage time allocation and prepare detailed lesson plans. For schools, this model can be adopted to enhance student-centered learning. For future researchers, further studies should investigate the model's effectiveness across different grade levels and subjects using experimental designs with control groups.

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