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Article

The Influence of Board Games on Junior High School Students' Learning Outcomes in Food Chain Material

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Article Info

5st AVES
Annual Virtual Conference of
Education and Science 2025

Keywords:

*board game,
learning outcomes,
food chain,
junior high school students,
science learning.*

ABSTRACT

education are used to increase student engagement and learning outcomes. This study aims to analyze the effect of using board games on junior high school students' learning outcomes in food chain material. The study was conducted at SMP Negeri 20 Kota Bengkulu using a quasi-experimental method and a pretest-posttest control group design. The research sample consisted of 60 eighth-grade students, divided into two groups: the experimental group and the control group. The results showed that the average pretest score of the experimental class increased from 48.50 to 71.50 on the posttest, while the control class increased from 47.00 to 55.50. The independent t-test results showed a Sig. (2-tailed) value of $0.001 < 0.05$, which means that there was a significant difference in the use of media on learning outcomes. The use of this medium is an effective pedagogical strategy that combines cognitive, affective, and social elements to deepen understanding of the food chain concept. Learning is not just memorization, but also the construction of meaningful ecological concepts. Students in the experimental class that used board games also showed higher interest in learning, were more active in discussions, and found it easier to understand the order of organisms in the food chain. Thus, the use of board games has been proven effective in improving learning outcomes while fostering enthusiasm among students in understanding the concept of the food chain.

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INTRODUCTION

Education is an important element for national progress because it plays a role in enlightening the community (Mulyaningsih et al., 2022). Teachers and students are the main components in the education system. Teachers not only act as educators, but also as mentors who help students develop their potential. Therefore, teachers are required to be creative and innovative in carrying out their roles and responsibilities (Anwar et al., 2023). Innovative learning can create an interesting and enjoyable learning atmosphere and increase students' enthusiasm in participating in learning activities (Rachman, 2022). One of the challenges in education today is transforming monotonous, teacher-centered learning into an active, participatory, and meaningful learning process. This challenge is particularly evident in science

education, which requires conceptual understanding and the ability to connect theory with everyday phenomena. Although

Science education is very important for developing students' cognitive and analytical abilities, but research shows that the reality in the field is still far from expectations. For example, Learning Science is Easy and Fun Using Models Project Based Learning by (Haryanti et al., 2024) found that students feel bored and lose interest when learning is too focused on theoretical aspects without interesting concrete activities.

In addition, research in Liberia entitled Exploring the determinants of primary school students' attitudes toward science: insights from students, teachers and head teachers in the left bank 2B district of Liberia (Williams et al., 2025) shows that the dominant science teaching method is teacher-centered, with minimal exploration and hands-on activities, as well as a lack of concrete learning resources, contributing to the perception that science is "too abstract," thereby reducing student motivation. These findings reinforce that one of the main obstacles to science learning is not merely the complexity of the material, but the overly theoretical delivery and lack of concrete activities. Thus, the use of more active, concrete, and participatory learning media is very important to improve students' perceptions and learning outcomes in science subjects. As a result, students have difficulty understanding important concepts such as the relationship between organisms, energy flow, and the role of each component in the ecosystem.

Low student learning outcomes in food chain material are not only influenced by academic ability, but also by learning strategies that have not been able to encourage active student engagement. Teachers need to create a more engaging learning environment through the use of interactive and enjoyable media. Effective learning media can help students understand abstract concepts in concrete terms while fostering motivation to learn. (Ilmiyah et al., 2024) emphasizes that the use of game-based media can make it easier for students to understand complex concepts because it provides a real learning experience and creates a sense of enjoyment..

One medium that can be used to create active and enjoyable learning is game-based media (Agustiya et al., 2017). Examples of this type of media include board games, which are educational games that combine elements of entertainment, strategy, and learning. Through board games, students can learn while playing in a positive competitive atmosphere. This activity encourages student engagement, promotes teamwork, and sharpens critical and logical thinking skills. Additionally, board games align with the characteristics of junior high school students who enjoy playing and social interaction, making learning more contextual and meaningful..

A number of previous studies support the effectiveness of game-based media in improving student learning outcomes and motivation. (Arifah & Widiyanti, 2023) state that educational game media can create a more active and student-oriented learning environment. The results of this study are in line with the findings of (Aqtoina et al., 2023), which show that the use of game-based learning media significantly improves student learning outcomes and cognitive skills. Their literature review confirms that educational game media allows students to be more active in the learning process, so that their understanding of concepts becomes deeper and their learning experience feels more meaningful. These findings support the use of educational game media as an effective learning strategy in simultaneously improving motivation, critical thinking skills, and understanding of science concepts. Another study by (S.Wardani et al., 2017) shows that inquiry-based board games can develop critical thinking skills and improve student learning outcomes.

Based on these findings, board games have great potential as learning tools that combine entertainment with cognitive achievement. However, their application in science education, particularly in teaching food chains at the junior high school level, is still rare. Therefore, this

study aims to analyze the effect of using board games on junior high school students' learning outcomes in food chain material.

The novelty of this research lies in the development of a board game called “Food Chain” that is specifically designed to facilitate understanding of ecological concepts. This game not only features a game board similar to Monopoly, but also includes organism cards that must be arranged into a complete food chain, from producers to decomposers. The game design combines educational, competitive, and collaborative elements, allowing students to learn about energy flow while actively playing. The rules of the game also require students to answer questions and apply thinking strategies to assemble additional food chains in order to earn the highest points. This innovation makes board games not only a means of entertainment, but also a meaningful learning medium that fosters cognitive, social, and affective engagement of students in understanding the concept of food chains comprehensively.

METHOD

This study uses a quantitative approach with a quasi-experimental research method. The design applied is a pretest–posttest control group design, which aims to compare learning outcomes between students who learn using board games and students who learn through conventional methods. This design allows for analysis of changes in students' abilities before and after the treatment is given.

The research was conducted at SMP Negeri 20 Bengkulu City in the odd semester of the 2024/2025 academic year. The research subjects consisted of eighth-grade students selected through purposive sampling based on academic ability equality. The research sample involved two classes, namely class VIII A as the experimental group using board games and class VIII B as the control group following conventional learning. Each class had 30 students, bringing the total number of research participants to 60. The research instruments included learning outcome tests and student activity observation sheets. The learning outcome test consisted of 20 multiple-choice questions compiled based on food chain competency indicators and validated by experts. The observation sheet was used to obtain additional data on student activities, participation, and enthusiasm during teaching and learning activities. The research procedure was carried out in three stages, namely:

- 1. Preparation stage:** developing learning tools, creating board game media, and validating research instruments.
- 2. Implementation stage:** administering pre-tests, conducting learning activities according to the treatment in each class, and administering post-tests after learning.
- 3. Data analysis stage:** processing and analyzing test data to determine the effect of board game media on improving student learning outcomes.

The data were analyzed quantitatively using SPSS software. The analysis consisted of two stages, namely descriptive analysis to describe the average pretest and posttest scores, and inferential analysis using the t-test to determine the difference in learning outcomes between the experimental and control groups. In addition, the increase in learning outcomes was calculated using N-Gain to assess the effectiveness of board games in understanding the concept of food chains. N-Gain values were categorized as high, medium, and low to describe the level of improvement that occurred

RESULTS AND DISCUSSION

This study aims to determine the effect of using food chain board games on the learning outcomes of eighth-grade students at SMP Negeri 20 Kota Bengkulu. The research data were obtained from pretest and posttest results given to two groups, namely the experimental class that used board games and the control class that followed conventional learning. In conventional learning, teachers delivered food chain material through lectures and discussions

without the aid of game media. The learning process tended to be teacher-centered, where students only listened to explanations and taking notes on important points conveyed by the teacher. This condition resulted in low student engagement and enthusiasm because learning activities were passive. In contrast, in the experimental class, students were directly involved in the learning process through board games that required cooperation, strategic thinking, and understanding of the food chain concept through direct interaction with game components. This approach is expected to improve learning outcomes and student engagement in understanding energy flow and the relationships between organisms in the food chain. The results of the pretest and posttest scores for both groups are presented in a table showing a comparison of the average learning scores, the number of students who achieved mastery, and the percentage of learning mastery in each class.

Table 1. Summary of Student Learning Outcomes

No	Class	Types of Tests	average	Completion		Completion
				Completed Not completed	Completed Not completed	
1	Experiment	Pre test	48,50	4	26	13,3%
		Post test	71,50	16	14	53,3%
2	Control	Pre test	47,00	2	28	6,7%
		Post test	55,50	7	23	23,3%

Based on the data in Table 1, the average pretest score for the experimental class was 48.50 with a mastery level of only 13.3%, while in the posttest, the average score increased to 71.50 with a mastery level of 53.3%. The minimum mastery criterion (KKM) used in this study was 70, so this increase shows that most students in the experimental class managed to reach or exceed the set mastery threshold. This proves that the use of board games can help students understand the concept of the food chain better through interactive and fun play activities. Meanwhile, the control class experienced a lower increase, from 47.00 (mastery rate of 6.7%) to 55.50 (mastery rate of 23.3%). With a KKM of 70, these results show that most students in the control class are still far from the standard.

This is in line with research by (Inayati & Sufathan, 2022), which discusses the application of the Teams Games Tournament (TGT) method combined with magnetic board media to create an attractive learning atmosphere and significantly improve student learning outcomes. Before the intervention, learning completeness was only 13.33%, but after two cycles it increased to 100%. The N-Gain calculation results (Table 2) show that the experimental class scored 0.46 (medium category), while the control class only scored 0.16 (low category). This indicates that the increase in student learning outcomes in the experimental class was greater and more significant than in the control class. Game-based learning can motivate students to be more active, interact, and understand science concepts better. This condition is in line with the findings that teachers need to innovate in the use of media to foster students' interest and creativity.

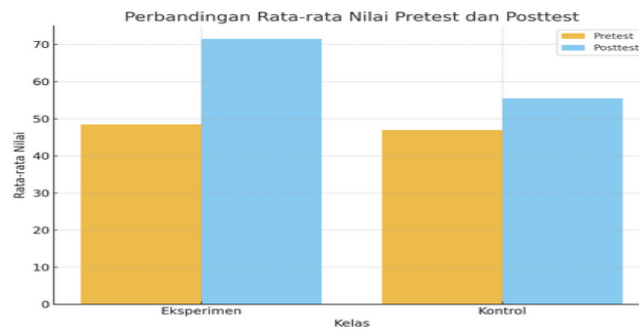


Figure 1. Diagram of students' average learning outcomes

Student involvement in the game allows them to directly experience the process of energy flow between organisms in the food chain, rather than just memorizing the sequence of producers–consumers–decomposers. Through game simulations, students observe the impact of changes in one component on the entire ecosystem, thereby forming a stronger and more comprehensive conceptual understanding. The higher learning outcomes in the experimental class show that board games have a significant effect on understanding the concept of the food chain. This medium provides an interactive, collaborative, and contextual learning experience, in which students actively discuss, think critically, and solve problems during the game. According to constructivist theory, students will more easily understand abstract concepts if they are directly involved in meaningful, experience-based learning activities. These results are in line with the view (Piaget, 1972) that emphasizes that knowledge develops through social interaction and scaffolding from peers in a collaborative learning context. In board games, students discuss, give each other feedback, and reinforce each other's understanding through real experiences.

In addition, the elements of competition and fun in board games encourage students to participate actively and strengthen their motivation to learn. According to (Slavin, 2012), learning that combines social and emotional aspects can increase student engagement and significantly improve learning outcomes. This is in line with the results of research by (Nurhayani et al., 2021) conducted at SDN Sindang Rasa Bogor, where the use of board games was proven to increase student motivation and engagement in science learning. This is in line with the finding that science learning often feels monotonous when only done using conventional methods, causing students to quickly become bored. The board game media developed through the ADDIE model was deemed feasible by experts with an average score above 80% and received positive responses from students with a feasibility rate of 88.5%. Thus, board games can be an effective and enjoyable alternative learning medium for elementary school students. Similarly, (Arifah & Widiyanti, 2023) found that educational games such as science monopoly are effective in improving student learning outcomes through group interaction and enjoyable learning activities.

Table 2. N-Gain Values for the Experimental and Control Classes

No	Class	N-Gain	Category
1	Experimental	0,46	Medium
2	Control	0,16	Low

Based on Table 2, the experimental class obtained an N-Gain score of 0.46, which is classified as moderate, while the control class only achieved 0.16, which is classified as low. The greater improvement in learning outcomes in the experimental group confirms that board games play an important role in improving students' understanding of the food chain concept. Playing activities allow students to

experiencing firsthand the processes of interorganismal relationships and energy flow within ecosystems, so that the concepts studied become more concrete and easier to understand.

The improvement in learning outcomes that occurred in the experimental group cannot be separated from the characteristics of board games as a medium that places students as active subjects in learning. Through play activities, students not only listen to the teacher's explanations but also experience the learning process directly through actions, strategies, and group discussions. This process fosters social interaction and collaboration, which play an important role in the formation of learning meaning. According to Vygotsky (1978), social interaction in the context of collaborative learning can develop higher-order thinking skills through scaffolding or learning support from peers. In addition, play activities accompanied by positive competition can foster students' intrinsic motivation to understand the concepts being studied. Students are encouraged to think critically, analyze game situations, and make decisions based on the ecological concepts they have understood. These findings are in line with the opinion of (Slavin, 2012), who asserts that learning based on cooperation and healthy competition can strengthen student engagement and increase their absorption of teaching materials.

The results of this study support the findings (Nadilah et al., 2025) which reported that the application of Educaplay-based educational games was effective in improving the critical thinking skills of fifth-grade students on solar system material. Their research shows that the experimental class involved in the game achieved significant improvement compared to the control class, indicating that interactive, challenging media that allows students to think reflectively is more effective than conventional methods. Furthermore, the use of educational games not only improves students' cognitive aspects but also has the potential to strengthen learning motivation and self-confidence because students are directly active in exploring and solving challenges in learning. These findings reinforce the importance of using educational games as a learning strategy that can integrate cognitive and affective aspects simultaneously.

Research (S. Wardani et al., 2017) also shows that the development of inquiry-based Chemistry Board Games can improve high school students' learning outcomes and critical thinking skills with an N-Gain of 0.703 in the high category. This shows that learning that combines elements of play with scientific context can create a balance between enjoyment and the achievement of learning objectives. Similarly, (Agustiya et al., 2017) found that game media in science learning can increase learning motivation, strengthen concept memory, and create a more conducive learning atmosphere. These findings reinforce that board games are a learning medium that not only improves cognitive learning outcomes but also facilitates the development of students' affective and psychomotor aspects. While playing, students practice socializing, appreciating the roles of their friends, and solving problems together. These values are very important in building scientific attitudes and cooperation, which are part of the objectives of science learning. From the perspective of constructivism theory, the improvement in the learning outcomes of the experimental class shows that knowledge is constructed through direct experience and active involvement in the learning process. According to Piaget (1972), students do not merely absorb information, but structure their knowledge based on interactions with their environment. Thus, food chain board games serve as a bridge between real-life experiences and abstract conceptual understanding. In addition to cognitive aspects, student engagement in the game also elicits positive emotions such as curiosity, enthusiasm, and excitement, which can expand thinking capacity and long-term memory. These positive emotions are important drivers of learning success because they influence student focus, concentration, and perseverance.

Thus, the results of this study reinforce previous findings that game-based learning media, including board games, are effective pedagogical strategies for improving learning outcomes, critical thinking skills, and student motivation and participation in science learning. This media not only provides an interactive and meaningful learning experience but also fosters scientific attitudes and social cooperation, which are important parts of 21st-century learning.

CONCLUSION

This study shows that the use of food chain board games significantly influenced the improvement of junior high school students' learning outcomes on food chain material. Students who learned using board games experienced higher learning outcomes compared to students who followed conventional learning. This medium was able to create an active, collaborative, and enjoyable learning atmosphere so that students could more easily understand ecological concepts, especially the relationships between organisms and energy flow in ecosystems. In addition to its impact on cognitive aspects, the use of board games also fosters motivation, cooperation, and critical thinking skills in students. Therefore, food chain board games can be used as an alternative innovative learning medium in science subjects at the junior high school level. Future development can be directed towards other science subjects and integrated with a project-based approach to support the mastery of 21st-century skills.

ACKNOWLEDGMENTS

The author would like to express his deepest gratitude to all those who have provided support, assistance, and prayers during the writing of this article. Special thanks go to the supervising lecturer and colleagues who have provided input and motivation so that this research could be carried out successfully. The author would also like to thank the school and students who agreed to be research subjects, as well as all those who helped, either directly or indirectly. May all the help that has been given be a good deed and be rewarded many times over by Allah SWT.

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