

The Design of Educational Board Game “Food Chain: Predator of the Food Chain” for Developing Academic Achievement on Ecosystem

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Abstract

This research has two primary objectives: 1) to develop an educational board game focused on food chains “Food Chain: Predator of the Food Chain” with the purpose of enhancing ecoliteracy, and 2) to investigate the effects of utilizing a food chain educational board game to enhance students' ecoliteracy and learning skills. The research instruments in this study consisted of 1) the educational board game “Food Chain: Predator of the Food Chain”. 2) an assessment of academic achievement 3) a rating scale satisfaction survey. The research outcomes indicate that 1) students' knowledge levels post-engagement with the game were significantly higher than pre-engagement levels, with statistical significance at the 0.05 level, and 2) overall satisfaction reflected that a high level of satisfaction.

Keywords: Educational Board Game, Game-Based Learning, Food Chain, Ecoliteracy

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Introduction

In the modern educational landscape, fostering ecoliteracy—the understanding of ecological systems and the interrelationships among living organisms—is paramount (Orr, 2004). As environmental issues become increasingly complex and pressing, it is crucial to equip students with the knowledge and skills necessary to comprehend and address these challenges (Sterling, 2001). One innovative approach to enhancing ecoliteracy is through the use of educational board games, which can provide an engaging and interactive learning experience (Gee, 2003). This research aims to contribute to this endeavor by achieving two primary objectives: developing an educational board game focused on food chains, "Food Chain: Predator of the Food Chain," aimed at enhancing ecoliteracy; and investigating the effects of utilizing this board game on students' ecoliteracy and learning skills.

The study employed a multi-faceted research methodology, incorporating the development and implementation of the board game, assessment of academic achievement, and measurement of student satisfaction (Brown, 2010). The findings from this research provided valuable insights into the effectiveness of educational board games as a pedagogical tool, revealing significant improvements in students' knowledge and high levels of satisfaction with the learning experience. Specifically, the results indicated that students' knowledge levels post-engagement with the game were significantly higher than pre-engagement levels, with statistical significance at the 0.05 level, and overall satisfaction levels were high. These outcomes underscored the potential of interactive learning tools in enhancing educational outcomes and fostering a deeper understanding of ecological concepts among students (Prensky, 2001).

Research Objectives

This study aims to achieve two primary objectives:

1. To develop an Educational Board Game: Designing and creating an educational board game titled "Food Chain: Predator of the Food Chain" with the primary purpose of enhancing ecoliteracy among students. This objective focuses on the creation of a game that effectively teaches the concepts of food chains and ecological relationships in an engaging and interactive manner.
2. To investigate the Educational Board Game's Effectiveness: Assessing the effects of utilizing the food chain educational board game on students' ecoliteracy and learning skills. This involves assessing the impact of the game on students' knowledge levels, measuring academic achievement before and after the game intervention, and evaluating students' satisfaction with the learning experience.

Methodology

Sample

The sample group of this study consists of one classroom of 17 elementary school students in Thailand.

The Research Tools

The research instruments in this study consisted of:

- 1) The educational board game "Food Chain: Predator of the Food Chain" to enhance ecoliteracy,
- 2) An assessment of academic achievement, and

3) A rating scale satisfaction survey.

The research methodology consisted of three main components.

1. Development of the Board Game

The board game "Food Chain: Predator of the Food Chain" was designed to teach students about food chains and ecological relationships through an engaging and interactive format. The game includes various elements such as predator-prey interactions, energy flow, and the balance of ecosystems.

Scenario: Players take on the role of predators in a food chain, both on land and in the sea. The player who can hunt the most food will be the winner of this game.

Playing time: 20-30 minutes

Age: 7 years and up

Number of players: 2-8

Subject: Science

Content: Food chain



Figure 1. Example Land ecosystem cards



Figure 2. Example Marine Ecosystem cards



Figure 3. Examples of boards: (a) Land food chain board; (b) Marine food chain board

2. Assessment of Academic Achievement

Students' understanding of food chains was assessed through pre-test and post-test evaluations. The tests measured the students' knowledge before and after engaging with the board game to determine any significant improvements.

3. Satisfaction Survey

A survey was administered to assess students' satisfaction with the board game as a learning tool. The survey measured various aspects of the learning experience, including engagement, enjoyment, and perceived educational value.

Results and Discussion

Academic Achievement in Understanding Food Chains

The study evaluated students' understanding of food chains before and after engaging with the "Food Chain: Predator of the Food Chain" board game. The results are detailed in Table 1.

Table 1: Comparison of Pre-Test and Post-Test Scores

Test	N	Mean	S.D.	t	Sig
Pre-Test	17	7.00	1.84	20.969	.000**
Post-Test	17	12.41	1.94		

Note: ** indicates significance at the .05 level

From Table 1, comparing the pre-test and post-test achievement on understanding the food chain, it was found that the learning achievement after the instructional activity using the Food Chain board game was significantly higher than before the instruction at the 0.05 level of statistical significance.

Characteristics of Learning Enthusiasm

The study also assessed students' learning enthusiasm using observation metrics, as shown in Table 2.

Table 2: Learning Enthusiasm Characteristics

Learning Characteristic	Mean	S.D.	Interpretation
Attention in class	2.49	0.22	High
Diligence and effort in learning	2.53	0.19	High
Interest in participating in learning activities	2.62	0.19	High
Appropriately researching additional knowledge	2.48	0.27	High
Recording, analyzing, and summarizing knowledge	2.46	0.27	High
Sharing and applying knowledge in daily life	2.54	0.28	High
Overall	2.52	0.24	High

According to Table 2, overall learning enthusiasm was high (mean = 2.52, S.D. = 0.24). Students showed the highest interest in participating in class activities (mean = 2.62, S.D. = 0.19), followed by sharing and applying knowledge in daily life (mean = 2.54, S.D. = 0.28), and diligence and effort in learning (mean = 2.53, S.D. = 0.19).

The findings indicated that the educational board game "Food Chain: Predator of the Food Chain" significantly enhanced students' understanding of food chains. The improvement in post-test scores compared to pre-test scores demonstrates the effectiveness of the board game as a learning tool. The statistical significance of these results ($p < .05$) further supported this conclusion.

Moreover, the assessment of learning enthusiasm revealed that the board game positively influenced students' engagement and interest in learning. The high levels of attention, diligence, and participation suggested that the interactive nature of the game fosters a conducive learning environment. This aligned with previous research indicating that game-based learning can increase student motivation and engagement (Gee, 2003; Prensky, 2001).

Conclusion

In conclusion, the study highlights the potential of educational board games to enhance both academic achievement and learning enthusiasm. The "Food Chain: Predator of the Food Chain" board game proved to be an effective tool in improving students' ecoliteracy and overall engagement in learning. Future research could explore the long-term effects of such educational tools and their applicability in other subject areas.

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