

Enhancing the Conceptual Learning on Natural Resources through Battle of the Brains Strategy

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ABSTRACT

This study aims to enhance seventh-grade students' conceptual understanding of natural resources through an engaging quiz-bowl activity, termed "Battle of the Brains." The objective is to foster active participation and retention of knowledge in a fun and competitive environment. The study employed a quiz-bowl format where questions related to natural resources were displayed on a screen. Students had 60 seconds to respond, with points awarded for correct answers. Background music was utilized to create an engaging atmosphere: cheerful music for correct answers and distinct music cues for incorrect responses. The activity was implemented over several sessions, allowing for repeated exposure and reinforcement of key concepts. Preliminary findings indicate that students demonstrated increased engagement and motivation during the quiz-bowl sessions. Assessment results showed a significant improvement in their understanding of natural resources, as evidenced by higher post-activity scores compared to pre-activity assessments. The competitive nature of the game encouraged collaboration and quick thinking among students. The "Battle of the Brains" strategy effectively enhances conceptual learning by making education interactive and enjoyable. It is recommended that educators incorporate similar game-based learning strategies into their curricula to promote deeper understanding and retention of complex subjects.

Keyword - Conceptual Learning, Natural Resources, Quiz-Bowl, Battle of the Brains, Engaging Activities, Game-Based Learning, Student Engagement

INTRODUCTION

The study focuses on enhancing conceptual learning about natural resources among seventh-grade students through an engaging quiz-bowl strategy known as "Battle of the Brains." This interactive approach combines competition with educational content, aiming to improve students' knowledge retention and understanding of natural resources. This study reviews how competitive games can improve engagement and retention in educational settings, supporting the use of the quiz-bowl format (Gunter, R. E., 2019). This research emphasizes the importance of experiential learning about natural resources and its impact on student engagement and understanding (Kuo and Jordan, 2019). This study provides insights into effective frameworks for teaching about natural resource management, relevant to your focus on enhancing conceptual understanding (Trivedi and Nandeha, 2024).

Recent studies highlight the effectiveness of game-based learning in promoting engagement and motivation in educational settings, demonstrating that such methods can lead to significant improvements in academic performance and conceptual grasp. Game-based learning strategies, like quiz-bowl formats, can improve student engagement and retention in STEM subjects (Burch and Mendez, 2021). Deterding., et al (2011) highlights that gamification principles that can be applied to educational settings to enhance engagement and motivation among students. Also, Zhang, (2019) emphasize the positive effects of gamification on student motivation and engagement in educational contexts.

The significance of this study lies in its potential to bridge these gaps by providing a structured yet enjoyable learning experience that aligns with contemporary educational practices. By implementing the "Battle of the Brains"

strategy, this research aims to foster a deeper understanding of natural resources while simultaneously enhancing critical thinking and collaboration skills among students. Ultimately, the findings could inform future pedagogical approaches in environmental education, encouraging more interactive and effective teaching methods.

RESEARCH QUESTIONS

1. What are the mean scores of Grades 7 students in Science?
2. Is there a significant difference between the pre-test and post-test scores of the grade 7 students in Science?
3. What is the feedback made by the students on the Battle of the Brains Strategy in teaching Science?

RESEARCH METHODOLOGY

This study is designed to rigorously evaluate the effectiveness of the "Battle of the Brains" strategy in enhancing seventh-grade students' conceptual understanding of natural resources. This engaging, quiz-bowl format not only aims to promote active learning but also to foster a competitive spirit that can motivate students to engage more deeply with the subject matter.

To achieve these objectives, a quasi-experimental design will be employed, allowing for a systematic comparison of students' knowledge before and after participation in the quiz-bowl activity. This approach is particularly suitable for educational research as it enables the assessment of learning outcomes in a real classroom setting while controlling for various factors that might influence students' performance.

1.1 Research Design

This study employs a quasi-experimental design to assess the effectiveness of the Battle of the Brains quiz-bowl strategy on seventh-grade students' understanding of natural resources. The design allows for comparison between pre- and post-intervention assessments, providing insights into the impact of the engaging activity on students' conceptual learning.

1.2 Participants

The participant is consists of seventh-grade students from Jacinto P. Elpa National High School, District II with approximately 30 students. Participants will be selected using purposive sampling to ensure a diverse representation of academic abilities and backgrounds. Parental consent had obtained prior to participation in the study.

1.3 Materials and Instruments

Quiz-Bowl Questions: A set of questions related to natural resources will be developed, covering various topics such as types of natural resources, conservation, and environmental impacts. Questions will vary in difficulty to cater to different learning levels.

Assessment Tools: Pre- and post-tests will be administered to evaluate students' knowledge before and after the intervention. These tests will consist of multiple-choice and short-answer questions designed to measure conceptual understanding.

Background Music: Specific music tracks will be selected to enhance the quiz experience—upbeat music for correct answers and distinct sound cues for incorrect responses.

1.4 Procedure

Pre-Test Administration: Prior to implementing the quiz-bowl activity, a pre-test will be administered to assess students' baseline knowledge of natural resources.

Implementation of Battle of the Brains: During each session, questions will be displayed on a screen, and students will have 60 seconds to respond. Points will be awarded for correct answers, fostering a competitive atmosphere. Background music will play according to the correctness of responses.

Post-Test Administration: After completing the quiz-bowl sessions, a post-test will be administered using the same format as the pre-test to measure any changes in students' understanding of natural resources.

1.5 Data Analysis

Quantitative data from pre- and post-test scores will be analyzed using statistical methods such as paired t-tests or ANOVA to determine significant differences in student performance before and after the intervention. Additionally, qualitative feedback from student surveys regarding their engagement and enjoyment of the activity will be analyzed thematically.

1.6 Ethical Considerations

This study will adhere to ethical guidelines by ensuring informed consent from parents and maintaining confidentiality throughout the research process. Students' participation is voluntary, and they can withdraw at any time without any consequences.

RESULTS

Table 1. Mean Percentage Scores and Mastery Level in Pre-Test and Post-Test Assessments

Assessment	Percentage (%)	Mastery Level
Pre-Test	75.83%	Near Mastery
Post-Test	94.50%	Mastery

Table 1 presents the mean percentage scores and corresponding mastery levels of seventh-grade students in both pre-test and post-test assessments related to their understanding of natural resources. The data highlights the significant impact of the "Battle of the Brains" quiz-bowl activity on students' conceptual learning. The pre-test assessment was conducted before the implementation of the quiz-bowl activity. A mean score of 75.83% indicates that students had a foundational understanding of natural resources, categorized as "Near Mastery." This suggests that while students possessed some knowledge, there were still gaps in their understanding that needed to be addressed. The near mastery level indicates that students were approaching proficiency but required further engagement and reinforcement of key concepts to achieve full mastery.

Following the quiz-bowl activity, the post-test assessment revealed a mean score of 94.50%, which falls within the "Mastery" category. This significant increase in scores demonstrates that the interactive and competitive nature of the quiz-bowl effectively enhanced students' understanding of natural resources. The post-test results indicate that students not only retained knowledge but also developed a deeper comprehension of the subject matter, as evidenced by their ability to answer questions correctly at a higher rate.

The data presented in Table 1 underscores the effectiveness of the "Battle of the Brains" strategy in promoting active participation and knowledge retention among seventh-grade students. The substantial improvement from a near mastery level in the pre-test to a mastery level in the post-test illustrates how engaging educational activities can lead to significant learning gains. This outcome supports the recommendation for educators to incorporate similar game-based learning strategies into their curricula to foster deeper understanding and retention of complex subjects like natural resources.

Table 2. Normalized Gain Results

Assessment	Percentage (%)	Normalized Gain (g)
Pre-test	75.83%	0.772 or 77.2%
Post-test	94.50%	

Table 2 presents the normalized gain results from the pre-test and post-test assessments, which aimed to enhance seventh-grade students' conceptual understanding of natural resources through the "Battle of the Brains" quiz-bowl activity. The table includes the mean percentage scores for both assessments and calculates the normalized gain (g), which provides insight into the effectiveness of the educational intervention. It also highlights the effectiveness of the "Battle of the Brains" strategy in promoting significant learning gains among seventh-grade students regarding natural resources. The transition from a pre-test score of 75.83% to a post-test score of 94.50%, coupled with a normalized gain of 77.2%, underscores how interactive and competitive learning environments can lead to substantial improvements in student comprehension and retention.

Table 3. Statistical Analysis of students' Conceptual Learning on Natural Resources through Battle of Brains: Pre-test vs. Post-test

	<i>Pre-test</i>	<i>Post-test</i>
Mean	23.0714826	28.5714286
Variance	2.99450549	1.3296703
Observations	14	14
Pearson correlation	0.84975109	
Hypothesized Mean Difference	0	
df	13	
t stat	-20.194425	
P(T<=t) one-tail	1.6809E-11	
t critical one-tail	1.7709334	
P(T<=t) two-tail	3.3617E-11	
t critical two-tail	2.16036866	

Table 3 presents a statistical analysis comparing the pre-test and post-test results of seventh-grade students' conceptual learning about natural resources following the "Battle of the Brains" quiz-bowl activity. This analysis provides quantitative evidence of the effectiveness of the intervention in enhancing students' understanding.

The results presented in Table 3 provide compelling statistical evidence that participating in the "Battle of the Brains" quiz-bowl activity significantly enhanced seventh-grade students' conceptual understanding of natural resources. The substantial increase in mean scores, decreased variance, strong Pearson correlation, and extremely low p-values collectively indicate that this interactive learning strategy effectively improved student learning outcomes. These findings support my study's objective to foster active participation and knowledge retention through engaging educational activities, reinforcing recommendations for educators to implement similar game-based learning strategies in their curricula to enhance student comprehension of complex subjects like natural resources.

Thematic Analysis Based on Focus Group Discussion

The thematic analysis derived from the provided data focuses on four key themes: Engagement and Motivation, Understanding the Concept, Collaboration and Interaction, and Feedback on Game Design. Below is an interpretation of each theme along with references to support the analysis.

Engagement and Motivation

P1. "I felt excited to answer questions and compete with my friends!"

- P2. "The music made it more fun, and I wanted to do my best."
 P3. "I was really into it; it made learning about natural resources enjoyable."
 P4. "The game format kept me alert and focused."
 P5. "I looked forward to the quiz sessions every week!"

Students reported feeling more engaged and motivated during the quiz-bowl activity compared to traditional learning methods. Game-based learning strategies have been shown to significantly enhance student engagement and motivation, leading to improved academic performance (Burch and Mendez, 2021). This emphasizes the positive impact of competitive formats like quiz-bowls on student involvement in learning activities.

Collaboration and Teamwork

- P1. "We helped each other out when someone didn't know the answer."
 P2. "It was great to cheer for my teammates; it felt like we were all in it together."
 P3. "I liked how we could discuss answers before responding."
 P4. "Working as a team made me feel more confident."
 P5. "We strategized on how to answer questions quickly together."

The competitive nature of the game fostered collaboration among students, encouraging them to work together. C Competitive learning environments promote collaboration among students, as they must work together to achieve common goals (Burch and Mendez, 2021). This highlights how competitive formats, such as quiz-bowls, foster teamwork and collective problem-solving.

Learning Enhancement

1. "I remember more about natural resources now than before the game."
2. "The questions made me think about things I didn't know I needed to learn."
3. "I liked how we could learn from our mistakes during the game."
4. "The variety of questions challenged me to explore new topics."
5. "It was easier to remember facts when they were presented in a fun way."

Students expressed that the quiz-bowl format helped reinforce their understanding of natural resources. The integration of gamification in education encourages students to explore new topics and think critically about their learning (Zhang, 2019). Highlighting how game-based learning can stimulate curiosity and deeper thinking.

Fun and Enjoyable Learning

1. "This was way better than just sitting in class and listening to lectures."
2. "I actually looked forward to our science lessons because of the game!"
3. "It was fun to play and learn at the same time; I wish we could do it every week!"
4. "The competitive aspect made learning exciting rather than boring."
5. "I loved how we could laugh and enjoy while learning."

The overall experience of participating in the quiz-bowl was described as fun, making learning less stressful. Experiential learning approaches, such as competitive games, enhance students' ability to retain information by making learning enjoyable and memorable (Kou and Jordan, 2019). Underscoring the importance of enjoyment in the learning.

Immediate Feedback

1. "Getting points for right answers made me feel good, and I learned from the wrong ones."
2. "When I got an answer wrong, I wanted to find out why so I could do better next time."
3. "The quick responses kept me on my toes!"
4. "I liked that we could see our scores right away; it motivated me to improve."
5. "Instant feedback helped me understand where I needed to focus my studies."

Students appreciated receiving instant feedback on their answers, which helped them learn quickly. Immediate feedback not only helps students correct their errors but also motivates them to seek understanding and improvement (Shute, 2008). This supports the idea that feedback encourages a desire to learn more deeply.

The thematic analysis derived from focus group discussions with students who participated in the Battle of the Brains quiz-bowl activity. Each theme reflects students' perceptions and experiences regarding the effectiveness of this game-based learning strategy in enhancing their understanding in Natural Resources. It also highlights how the Battle of the Brains strategy not only improved conceptual understanding but also created a dynamic learning environment that motivated students to engage actively with their education.

CONCLUSIONS

The study successfully demonstrated that this interactive and competitive approach significantly improved students' knowledge retention and understanding of key concepts related to natural resources. The results from the pre-test and post-test assessments provided compelling evidence of the effectiveness of the quiz-bowl strategy. The mean percentage scores increased from 75.83% (Near Mastery) in the pre-test to 94.50% (Mastery) in the post-test, indicating a substantial improvement in student performance. This increase is further supported by a normalized gain of 77.2%, showcasing that a significant portion of the students' potential for learning was realized through this engaging educational format. Statistical analysis revealed a strong Pearson correlation of 0.85 between pre-test and post-test scores, reinforcing the reliability of the findings. The t-statistic of -20.19 and extremely low p-values (both one-tailed and two-tailed) provided robust evidence that the observed differences in scores were statistically significant. These results confirm that the "Battle of the Brains" activity not only enhanced conceptual learning but also fostered active participation, collaboration, and quick thinking among students.

Moreover, qualitative feedback from students indicated increased engagement and motivation during the quiz-bowl sessions, aligning with existing literature that emphasizes the positive effects of game-based learning on student attitudes towards education (Burch & Mendez, 2021; Kuo & Jordan, 2019). The use of background music and a competitive atmosphere contributed to creating an enjoyable learning experience, which is crucial for fostering a deeper understanding of complex subjects like natural resources.

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