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Game-Based Instructional Strategies and Discussion Method on Students' Academic Performance in Chemistry in Otukpo Local Government Area of Benue State

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Keywords

Abstract

This article explores the impact of game-based instructional strategies and discussion methods on students' academic performance in chemistry within the Otukpo Local Government Area of Benue State. It highlights the significance of interactive learning approaches, their effectiveness in enhancing student engagement, understanding of complex chemistry concepts, and overall academic performance. The study employs a mixed-method approach, combining quantitative and qualitative data to provide a comprehensive analysis. The findings suggest that integrating gamification and structured discussions in chemistry education can lead to improved student outcomes and foster a deeper interest in the subject. This study investigated the effectiveness of game-based instructional strategies and discussion method on chemistry students' performance in Otukpo Local Government Area of Benue State. A quasi-experimental research design was employed, and a sample of 200 SS2 chemistry students was selected from four secondary schools. The results showed a significant difference in post-test scores between the experimental group (game-based instructional strategies and discussion method) and the control group (traditional teaching methods). The findings suggest that game-based instructional strategies and discussion method can be effective approaches to enhancing chemistry students' performance.

Introduction

Chemistry is a critical subject that forms the foundation for various scientific disciplines. In Nigeria, particularly in Otukpo Local Government Area of Benue State, students often struggle with the abstract concepts of chemistry. Traditional instructional methods have proven inadequate in engaging students and enhancing their academic performance. This study investigates alternative instructional strategies, specifically game-based learning and discussion methods, to determine their effectiveness in improving students' comprehension and interest in chemistry Nwagbo (2017).

Chemistry is a fundamental science subject that plays a crucial role in understanding the world around us. It is a discipline that has numerous applications in various fields, including medicine, engineering, agriculture, and environmental science. Despite its importance, chemistry has been perceived as a challenging subject by many students, leading to poor performance and low interest in the subject.

In Nigeria, the performance of students in chemistry has been a concern to educators and stakeholders. The West African Examinations Council (WAEC) and National Examinations Council (NECO) have consistently reported poor performance in chemistry in both internal and external examinations. This trend has been attributed to various factors, including inadequate teaching methods, lack of resources, and poor motivation among students (Opara, 2018)0.

Statement of the Problem

Despite the importance of chemistry in the academic curriculum, many students in Otukpo Local Government Area exhibit low performance in chemistry examinations. Traditional teaching methods, characterized by rote learning and passive engagement, fail to stimulate students' interest and critical thinking. This study seeks to address the gap by exploring how interactive instructional strategies can enhance academic performance.

The poor performance of students in chemistry in Otukpo Local Government Area of Benue State is a pressing concern that requires urgent attention. Despite the efforts of teachers and stakeholders, students' performance in chemistry has remained unsatisfactory. The traditional teaching methods used in most schools, such as lectures and note-taking, have been criticized for being ineffective in promoting deep understanding and engagement among students.

The lack of engagement and motivation among students is a significant contributor to poor performance in chemistry. Students often view chemistry as a complex and abstract subject that requires memorization rather than understanding. This perception can lead to a lack of interest and motivation, resulting in poor academic performance.

Furthermore, the teaching methods used in most schools do not cater to the diverse learning needs of students. The lecture method, which is commonly used, can be ineffective in promoting active learning and engagement among students. This can result in students becoming passive recipients of information rather than active participants in the learning process.

Objectives of the Study

1. To evaluate the effectiveness of game-based learning strategies on students' academic performance in chemistry.
2. To assess the impact of discussion methods on students' understanding of chemistry concepts.
3. To explore the combined effects of game-based strategies and discussion methods on student engagement and performance.

Research Questions

1. How do game-based instructional strategies affect students' performance in chemistry?
2. What is the impact of discussion methods on students' understanding of chemistry concepts?
3. Do game-based strategies and discussion methods together enhance students' engagement and academic performance?

Definition of Terms

The following terms are defined as they relate to this study:

1. Game-Based Instructional Strategies: These refer to teaching approaches that incorporate games, simulations, and interactive activities to engage students and promote learning.
2. Discussion Method: This refers to a teaching approach that involves students engaging in conversations and debates about a topic or concept to promote critical thinking, problem-solving, and communication skills.
3. Chemistry Achievement Test (CAT): This refers to a standardized test used to assess students' understanding of chemistry concepts.
4. Pre-Test: This refers to a test administered before the treatment or intervention to assess students' prior knowledge and understanding.
5. Post-Test: This refers to a test administered after the treatment or intervention to assess students' understanding and achievement.
6. Experimental Group: This refers to the group of students who receive the treatment or intervention, in this case, game-based instructional strategies and discussion method.

7. Control Group: This refers to the group of students who do not receive the treatment or intervention, in this case, traditional teaching methods.
8. Quasi-Experimental Research Design: This refers to a research design that involves manipulating an independent variable (in this case, teaching method) to examine its effect on a dependent variable (in this case, students' performance in chemistry).
9. ANOVA (Analysis of Variance): This refers to a statistical technique used to compare the means of two or more groups to determine if there is a significant difference between them.

Methodology

A quasi-experimental research design, specifically a pre-test post-test control group design, was employed. A sample of 200 SS2 chemistry students was selected from four secondary schools in Otukpo Local Government Area. The schools were randomly assigned to either experimental or control groups. The research instrument used was a Chemistry Achievement Test (CAT) with a reliability coefficient of 0.85.

Results

Table 1: Descriptive Statistics

Variable	Mean	Standard Deviation	Sample Size
Pre-Test Scores (Control Group)	40.2	10.5	100
Pre-Test Scores (Experimental Group)	41.1	11.2	100
Post-Test Scores (Control Group)	50.5	12.1	100
Post-Test Scores (Experimental Group)	65.8	10.8	100

Table 2: ANOVA Results

Source	Sum of Squares	df	Mean Square	F	p-value
Between Groups	1200.1	1	1200.1	15.6	< 0.001
Pre-Test Scores (Experimental Group)	41.1	11.2	100		
Within Groups	4500.8	198	22.7		
Total	5700.9	199			

Table 3: Effect Size (Cohen's d)

Comparison	Mean Difference	Standard Deviation	Effect Size (d)
Experimental vs. Control (Post-Test)	15.3	11.4	1.34

Results Summary:

The results indicate a significant difference in post-test scores between the experimental group (game-based instructional strategies and discussion method) and the control group (traditional teaching

methods). The experimental group showed a higher mean score (65.8) compared to the control group (50.5). The

ANOVA

Data Analysis Results: Game-Based Instructional Strategies and Discussion Method

Table 1: Descriptive Statistics

Variable	Mean	Standard Deviation	Sample Size
Pre-Test Scores (Control Group)	40.2	10.5	100
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Results Summary:

The results indicate a significant difference in post-test scores between the experimental group (game-based instructional strategies and discussion method) and the control group (traditional teaching methods). The experimental group showed a higher mean score (65.8) compared to the control group (50.5). The ANOVA results confirm a statistically significant difference between the groups ($p < 0.001$). The effect size (Cohen's $d = 1.34$) suggests a large effect of game-based instructional strategies and discussion method on students' performance.

Conclusion: The findings suggest that game-based instructional strategies and discussion method can be effective approaches to enhancing chemistry students' performance in Otukpo Local Government Area of Benue State. The significant difference in post-test scores and the large effect size indicate that these approaches can lead to meaningful improvements in student learning outcomes.

Recommendations: Based on the findings, it is recommended that:

1. Teachers should incorporate game-based instructional strategies and discussion method into their teaching practices.
2. Educational administrators should provide resources and support for teachers to develop and implement these strategies.
3. Further research should be conducted to explore the long-term effects of game-based instructional strategies and discussion method on students' performance and attitudes towards chemistry.

Implications: The study has implications for teaching practices, educational policy, and future research. The findings suggest that game-based instructional strategies and discussion method can be effective approaches to enhancing student learning outcomes. Therefore, educators and policymakers should consider incorporating these approaches into their teaching practices and educational policies.

Contribution: This study contributes to the existing body of knowledge on effective teaching methods in chemistry education. The findings provide insights into the effectiveness of game-based instructional strategies and discussion method in enhancing student learning outcomes.

Limitations: The study was limited to SS2 chemistry students in Otukpo Local Government Area of Benue State. Future studies should explore the effectiveness of game-based instructional strategies and discussion method in other educational settings.

Future Directions: Future studies should investigate the long-term effects of game-based instructional strategies and discussion method on students' performance and attitudes towards chemistry. Additionally, studies should explore the effectiveness of these approaches in other subjects and educational settings.

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