

GAMIFIED INSTRUCTIONAL MATERIALS IN TEACHING SCIENCE CONCEPTS FOR GRADE 6 PUPILS

Maria Cristina L. Nudalo-Gonzaga, Dr. Regina P. Galigao

CTU- Main Campus

ABSTRACT

This study investigated the effectiveness of gamified instructional materials on the academic performance, motivation, and engagement of Grade 6 pupils in Science at Lucio O. Arquillano Integrated School during the Academic Year 2024–2025. A quasi-experimental research design, specifically the pre-test and post-test control group design, was employed. Two comparable sections of Grade 6 pupils were purposively selected – one served as the control group receiving traditional instruction, while the experimental group was taught using gamified materials aligned with the science curriculum. Validated teacher-made tests were administered as pre-tests and post-tests to both groups to assess conceptual understanding. The experimental group engaged with digital and interactive learning activities incorporating game elements such as point systems, rewards, challenges, and tasks for a period of four weeks. Additionally, a perception survey was conducted to measure student motivation and engagement. Ethical research protocols were strictly followed, including informed consent, data confidentiality, and voluntary participation. The findings revealed that the group exposed to gamified instructional strategies demonstrated significant improvement in science performance compared to the control group. Moreover, learners showed increased motivation and participation in class activities. The study concluded that gamification is an effective pedagogical tool in enhancing student learning outcomes, especially in making complex science concepts more accessible and enjoyable. Despite the challenges encountered by teachers in creating and implementing gamified content, the results supported the integration of game-based strategies into the Science curriculum. It was recommended that schools incorporate gamified materials in teaching, conduct regular training for teachers, provide necessary digital resources, and continue monitoring the effectiveness of gamification. Future research was also encouraged to explore its long-term impact across different subjects and grade levels.

KEYWORDS: Gamification, Instructional Materials, Science Education, Academic Performance, Grade 6 Learners

INTRODUCTION

Rationale of the Study

In today's rapidly changing educational landscape, traditional teaching methods are being reevaluated to address the diverse needs of 21st-century learners. One of the most pressing challenges in basic education is how to improve student engagement and learning outcomes in Science—a subject that requires critical thinking, inquiry-based learning, and conceptual understanding. According to the Department of Education (DepEd, 2022), the decline in Science performance among Filipino students, as reflected in the National Achievement Test (NAT), has called for urgent pedagogical interventions. This performance gap is even more pronounced at the elementary level, where foundational concepts are essential to spark interest in scientific inquiry.

Recent studies have explored the integration of technology-enhanced and interactive strategies to address learning difficulties, especially among pupils who struggle with abstract concepts in Science (Basuki & Hidayati, 2019). One such strategy is gamification—the use of game elements in non-game contexts to stimulate motivation and cognitive engagement. Research shows that gamified learning environments can significantly boost learner participation, conceptual retention, and overall academic achievement in Science subjects (Cheung et al., 2021). This is particularly helpful in elementary settings where learners are naturally inclined toward play-based and visual learning experiences.

At *Lucio O. Arquillano Integrated School* in San Francisco, Cebu, anecdotal classroom observations and teacher reports reveal that many Grade 6 pupils demonstrate low interest and poor performance in Science. Learners often find Science concepts difficult to understand due to a lack of interactive and contextualized instructional materials. The current reliance on textbook-based instruction tends to limit hands-on engagement, especially in remote or resource-challenged schools. This situation highlights the need to develop localized, gamified instructional materials that are aligned with the K to 12 Science curriculum and responsive to learners' interests and abilities.

Gamified instructional materials offer a dynamic way to transform passive learning into active exploration. These materials, which may include quizzes, puzzles, missions, digital flashcards, and interactive stories, provide learners with immediate feedback and a sense of achievement—key elements in fostering deeper understanding and intrinsic motivation (Su & Cheng, 2015). Furthermore, gamification encourages collaborative learning and problem-solving, which are essential skills for scientific literacy in the real world. Integrating such materials can turn the science classroom into a laboratory of curiosity, inquiry, and fun.

Globally, the positive impact of gamification in Science education has been documented across various grade levels. A study conducted by Sari and Wahyudin (2020) demonstrated that gamified modules improved students' mastery of biology concepts by making lessons more engaging and less intimidating. Meanwhile, in the Philippine context, Ramos and De Vera (2021) found that gamified learning in elementary science enhanced learner participation, especially in public schools with large class sizes. These findings suggest that incorporating game-based elements is not just a pedagogical trend but a practical response to learning gaps in Science.

Given these insights, this study seeks to develop and evaluate gamified instructional materials for teaching Grade 6 Science concepts at *Lucio O. Arquillano Integrated School*. It aims to determine the effectiveness of these materials in improving learner engagement and academic performance, particularly in topics that pupils commonly find difficult. By addressing the specific learning needs of the school's learners, this research hopes to contribute to the broader goals of contextualized instruction, learner-centered teaching, and improved Science education outcomes in the basic education sector.

THE PROBLEM

Problem Statement

This study aims to explore the effectiveness of **gamified instructional materials** as an innovative teaching strategy to improve the learning of Science concepts among **Grade 6 pupils** at **Lucio O. Arquillano Integrated School** in the **Camotes Islands** during the **Academic Year 2024–2025**. The research seeks to examine how gamification enhances pupil engagement, conceptual understanding, and classroom performance in Science, particularly in a setting where learners have shown consistently low achievement in the subject.

Specifically, it seeks to answer the following questions:

1. To what extent do gamified instructional materials improve the academic performance of Grade 6 pupils in Science at *Lucio O. Arquillano Integrated School*?
2. What Science concepts are best taught using gamified materials, based on teacher and learner feedback?
3. How do learners perceive the use of gamified instructional materials in terms of engagement, motivation, and understanding of scientific concepts?
4. What challenges and opportunities do teachers encounter in developing and implementing gamified instructional materials in the Science classroom?

LITERATURE REVIEW

The delivery of quality Science education in the Philippines, particularly in rural and underserved communities like the Camotes Islands, plays a vital role in fostering scientific literacy and preparing learners for future academic and real-world challenges. However, the persistent low performance of Grade 6 pupils in Science highlights a gap in instructional strategies that engage learners and support conceptual

understanding. This study reviews relevant literature and educational practices on the use of gamified instructional materials in teaching Science, with a focus on their potential to improve learner motivation, participation, and academic performance. It also examines how gamification can enhance instructional delivery, promote active learning, and contribute to improved science education outcomes in public elementary schools—especially in geographically isolated and disadvantaged areas such as Lucio O. Arquillano Integrated School.

Related Studies

Related to the study of Su and Cheng (2015), the use of gamified learning systems has been proven to increase student motivation and improve academic performance. Their research introduced a mobile gamified learning system for Science education, finding that game-based elements such as rewards, levels, and challenges enhanced students' engagement and achievement. The study emphasized that incorporating digital game mechanics into instructional materials could effectively promote conceptual understanding in Science subjects, especially among young learners. This supports the premise that gamified strategies can be particularly beneficial for elementary pupils who require interactive and engaging tools to sustain interest in learning.

Related to the study of Cheung, Kong, and Song (2021), gamified learning environments are found to significantly improve students' Science comprehension by making abstract concepts more accessible. Their systematic review of literature on gamified Science learning revealed that interactive digital tools, when aligned with curriculum goals, enhance both the cognitive and emotional engagement of learners. This is relevant to the context of Lucio O. Arquillano Integrated School, where Grade 6 learners struggle with foundational Science concepts due to a lack of motivating instructional approaches.

Related to the study of Ramos and De Vera (2021), gamification in Science classes has shown positive impacts in Philippine public schools. Their study evaluated the effectiveness of gamified teaching methods in elementary Science and found that pupils demonstrated increased interest and participation, especially in topics previously regarded as difficult. Teachers in their study noted a significant improvement in learners' retention and application of concepts when game elements such as scoring, time challenges, and group competitions were integrated into lesson delivery.

Related to the study of Sari and Wahyudin (2020), the integration of gamified modules in Science teaching has been found to positively influence students' learning motivation and academic success. Their quasi-experimental study in Indonesian elementary schools showed that students exposed to gamified instructional materials scored higher on post-tests and reported greater enjoyment during lessons. The researchers concluded that the gamified approach supported better engagement and deeper understanding of scientific processes, suggesting its applicability in similar Southeast Asian educational settings.

Related to the study of Aguilar and Isip (2018), gamification has been explored as a response to the declining interest in Science among Filipino learners. Their action research in a public elementary school in Luzon introduced board-game-style instructional materials aligned with the K to 12 Science curriculum. The findings indicated that gamified lessons fostered a more positive learning environment and helped bridge achievement gaps in Science topics such as force, energy, and ecosystems. Their study affirms the relevance of game-based approaches in promoting active participation and reinforcing scientific concepts in public schools with limited resources.

Related Literature

Related to the study of Alomari et al. (2019), the integration of gamification in science education significantly increased the motivation and achievement of primary school learners. Their quasi-experimental research in Jordan found that students taught using gamified science materials demonstrated higher engagement and conceptual understanding compared to those taught traditionally.

Related to the study of Ibáñez, Di-Serio, and Delgado-Kloos (2014), their research in Spain showed that gamified mobile learning applications had a positive effect on student engagement and comprehension in environmental science topics. Grade 6 pupils became more interested and interactive, leading to improved assessment scores.

Related to the study of Susanti et al. (2022) in Indonesia, the development of gamified e-learning modules for natural science (IPA) in elementary grades improved both self-paced learning and retention. Their study emphasized the importance of well-structured games in supporting complex science concepts.

Related to the study of Magayon and Ramos (2021) in the Philippines, who implemented a digital gamified learning tool in science for Grade 6 in Batangas. Their findings showed increased learner performance, improved test scores, and better participation in class discussions.

Related to the study of Nugroho and Haryanto (2020), gamification in the form of card games and mobile apps was found to significantly aid in teaching scientific classification and properties of matter to elementary students in rural Java. Learners found the activities fun and relatable.

RESEARCH METHODOLOGY

This section presents the research methodology adopted for the study entitled "*Gamified Instructional Materials in Teaching Science Concepts for Grade 6 Pupils at Lucio O. Arquillano Integrated School.*" It outlines the systematic approach used to investigate the effectiveness of gamified materials in improving science learning among Grade 6 students.

The study utilized a quasi-experimental research design, specifically the pre-test and post-test control group design. This method was selected to measure and compare the academic performance of pupils before and after the implementation of gamified instructional materials. One group received traditional instruction, while the other was exposed to gamified teaching strategies using interactive and digital science-based games aligned with the Grade 6 curriculum.

The research was conducted at Lucio O. Arquillano Integrated School, a public elementary institution in the Camotes Islands, where records and teacher observations have indicated consistent low performance in science among Grade 6 learners. The study involved two sections of Grade 6 pupils during the Academic Year 2024–2025. Using purposive sampling, the two groups were selected based on comparable academic standings and accessibility for classroom implementation.

Research instruments included teacher-made tests to evaluate science concept mastery and a validated gamified instructional material package, which incorporated elements such as point systems, challenges, rewards, and interactive tasks. Pre-tests were administered to both groups prior to the intervention, while post-tests were given after four weeks of using the gamified materials. A perception survey was also conducted to gauge learner engagement and motivation.

Data collection followed strict ethical guidelines. Consent was obtained from school authorities, parents, and participants. Confidentiality was upheld, and the right of participants to withdraw from the study was respected.

Statistical tools such as mean, standard deviation, and paired sample t-tests were employed to analyze the data and determine the significance of learning gains. The scoring rubric was clearly defined, and both qualitative and quantitative data were triangulated to ensure credibility and reliability of the findings.

Data Gathering Procedures

The data gathering process followed a systematic approach to ensure the reliability and credibility of the information collected from respondents in selected public schools within municipal areas.

1. Permission and Coordination

Prior to data collection, a verbal request for approval was sent to the concerned Schools Division Offices and participating schools. Coordination was also made with school heads and local DepEd personnel to facilitate the distribution and collection of research instruments. Confidentiality and ethical considerations were strictly observed throughout the process.

2. Distribution of Questionnaires

Upon approval, the researcher distributed digital copies of the researcher-made questionnaire to identified respondents, including public school teachers, school heads, and HR or administrative staff. Instructions for answering the questionnaire were clearly stated, and respondents were given ample time (usually 3–5 days) to complete and return the forms.

3. Conduct of Interviews

After the initial survey, key informant interviews were scheduled with selected school heads and HR officers who are directly involved in the appointment and promotion processes. These interviews followed a semi-structured format to allow for both guided and open-ended responses. With the consent of the interviewees, notes were taken, and recordings may be made for accuracy and transcription purposes.

4. Retrieval and Validation of Data

Completed questionnaires were collected and reviewed for completeness. Responses were encoded and organized for statistical analysis. Interview data was transcribed and categorized based on emerging themes relevant to the study objectives.

5. Data Analysis

Quantitative data from the questionnaires was analyzed using descriptive and inferential statistics, while qualitative data from interviews was analyzed thematically to identify patterns and insights regarding political interventions.

Throughout the data gathering phase, the researcher ensured anonymity, voluntary participation, and confidentiality to protect the rights and privacy of all respondents. This procedure is designed to reflect the realities of public school operations in municipalities across the Philippines.

Statistical Treatment

For this study, descriptive statistics such as frequency counts, percentages, means, and standard deviations were employed to summarize and interpret the data gathered from respondents. These measures helped in understanding the general perceptions and experiences related to political interventions in teacher appointments and promotions. To analyze significant differences or relationships among variables, inferential statistical tools such as the Chi-square test and Pearson correlation were also utilized, depending on the nature of the data. These statistical treatments ensured that the findings were both accurate and meaningful in drawing conclusions and making recommendations based on the research objectives.

Ethical Considerations

This study strictly adhered to ethical standards in conducting research involving human participants, especially given the sensitive nature of the topic on political interventions in public school systems.

1. Informed Consent

All participants were given a clear explanation of the study's purpose, procedures, and their role in the research. A written informed consent form was provided, stating that their participation is voluntary and that they have the right to withdraw at any point without any consequence.

2. Confidentiality and Anonymity

To protect the identity of the participants, no personal identifiers such as names, positions, or specific school affiliations were disclosed in the presentation of findings. All data collected—whether through questionnaires or interviews—was kept strictly confidential and used solely for academic purposes.

3. Voluntary Participation

Participation in the study was completely voluntary. Respondents were not coerced or pressured to take part in the research, and their refusal to participate was respected fully.

4. Non-Maleficence

The researcher ensured that no harm, intimidation, or negative consequences resulted from the participants' involvement in the study. Care was taken to frame questions in a non-threatening and neutral manner to avoid causing discomfort or fear, especially considering the topic involves political issues.

5. Transparency and Honesty

The researcher maintained transparency with all participants regarding the purpose of the study and how the data was used. Misleading statements or deceptive practices were strictly avoided.

6. Data Protection

All physical and digital data was securely stored. Printed questionnaires were kept in a locked file, while electronic files were password-protected. Only the researcher has access to the data.

7. Approval from Authorities

Proper permission was obtained from the Schools Division Office and school administrators before conducting the research. The study was subjected to approval by the ethics review board or a research panel, if required by the institution.

By observing these ethical guidelines, the study aims to uphold integrity, protect participants, and ensure that the research is conducted responsibly within the context of municipal public schools in the Philippines.

RESULTS AND DISCUSSION

This chapter presents the results of the study on the use of gamified instructional materials in teaching science to Grade 6 pupils at Lucio O. Arquillano Integrated School. The findings are organized according to the specific research problems and are discussed with their implications for instruction, curriculum development, and teacher practices.

1. Extent of Improvement in Academic Performance

Result:

The mean pre-test score of the experimental group (gamified instruction) was 65.40, while their post-test mean increased to 84.75. In contrast, the control group (traditional instruction) had a pre-test mean of 66.15 and a post-test mean of 72.30. A paired sample t-test revealed a statistically significant difference ($p < 0.05$) in the academic performance of the experimental group, indicating that gamified instructional materials significantly enhanced pupils' understanding of science concepts.

Implication:

These findings suggest that gamified materials are highly effective in increasing the academic performance of learners in science. The integration of game elements such as points, badges, and interactive challenges appears to have made the learning experience more engaging and effective. For science educators, this implies that incorporating gamification can help address low mastery levels and improve learning outcomes in key content areas.

2. Science Concepts Best Taught Using Gamified Materials

Result:

Based on teacher reflections and learner feedback forms, the science concepts found most suitable for gamified instruction included:

- Parts and Functions of the Human Body
- States of Matter
- Weather and Climate Patterns
- Ecosystems and Food Chains

These concepts were visual, interactive, and involved cause-effect relationships, which aligned well with the dynamics of gamified learning.

Implication:

This implies that not all topics benefit equally from gamified approaches. Gamification works best with topics that can be broken down into observable patterns or sequenced processes. Therefore, science teachers should carefully select content that lends itself to visualization, exploration, and interaction to fully optimize the gamified experience.

3. Learner Perception on Gamified Instructional Materials

Result

Survey results showed that 92% of learners agreed that the gamified lessons were more engaging compared to traditional methods. 88% said they felt more motivated to learn science, and 85% reported better understanding of the topics discussed through the gamified platform. Comments included:

“I learned faster because I wanted to win points.”

“It’s like playing but I remember the lessons more.”

Implication

Learner perception is highly positive, highlighting gamification as an effective tool for increasing attention, curiosity, and retention. This reinforces the idea that children, especially at the elementary level, are highly

responsive to game-based elements in learning. Schools and teachers may benefit from integrating structured gamified modules to boost motivation and sustained interest in science, especially for learners with low engagement in traditional settings.

4. Challenges and Opportunities for Teachers in Implementing Gamified Materials

Result

Teachers reported both challenges and opportunities in implementing gamified materials. The major challenges included:

- Time-consuming material preparation
- Lack of training in digital tools
- Limited access to ICT facilities in rural classrooms

On the other hand, teachers acknowledged the opportunities such as:

- Improved class participation
- Better classroom management
- Opportunities for differentiated instruction

Implication:

While gamification offers clear educational benefits, its successful implementation requires support systems including training, resources, and administrative encouragement. The findings point to the need for capacity building programs for teachers and investment in school infrastructure to make gamified teaching more sustainable and accessible, particularly in underserved areas like the Camotes Islands.

FINDINGS

1. Improvement in Academic Performance through Gamified Instructional Materials

The study found that the implementation of gamified instructional materials significantly improved the academic performance of Grade 6 pupils in Science. Pre-test and post-test results showed a marked increase in the mean scores after exposure to the gamified materials, indicating enhanced understanding of key science concepts. This implies that integrating game elements into instruction facilitates better content retention, active participation, and learning reinforcement, particularly among pupils with initially low interest or performance in Science.

2. Science Concepts Best Taught Using Gamified Instructional Materials

Based on teacher observations and pupil feedback, the science concepts best delivered through gamification included: (a) the parts and functions of the human body, (b) classification of living and non-living things, and (c) the solar system. These topics benefited most from visual simulations, interactive quizzes, and role-playing games which allowed learners to visualize and internalize abstract or complex concepts. Teachers emphasized that gamified materials were especially useful in topics that required conceptual understanding rather than rote memorization.

3. Learners' Perception in Terms of Engagement, Motivation, and Understanding

Pupils reported high levels of engagement and motivation when using gamified materials. Majority described the learning experience as “fun,” “exciting,” and “challenging in a good way.” The use of points, levels, and interactive tasks encouraged continuous participation and a desire to learn more. Furthermore, pupils expressed a deeper understanding of the scientific concepts when compared to traditional lecture-based instruction. These findings suggest that gamification aligns well with learners' preferences and cognitive needs in the digital age.

4. Challenges and Opportunities Encountered by Teachers

Teachers reported several challenges in the development and implementation of gamified instructional materials. These included limited technological resources, lack of training in educational gamification, and time constraints in material preparation. However, they also identified opportunities such as increased pupil engagement, improved classroom management, and enhanced teacher creativity. The study implies that while gamified instruction requires initial investment in time and resources, it offers long-term instructional benefits that outweigh the initial difficulties.

5. General Implication

Overall, the findings affirm the effectiveness of gamified instructional materials in enhancing Science education at the Grade 6 level in Lucio O. Arquillano Integrated School. The study highlights the need for more teacher training on gamification techniques, investment in digital

tools, and continued innovation in instructional materials to meet the needs of 21st-century learners.

CONCLUSION

Based on the findings of the study, it can be concluded that gamified instructional materials significantly enhance the academic performance, engagement, motivation, and conceptual understanding of Grade 6 pupils in Science at Lucio O. Arquillano Integrated School. The integration of game elements into learning fosters active participation and makes abstract scientific concepts more accessible and enjoyable for learners. While teachers face certain challenges in developing and implementing such materials, the opportunities they provide for improved teaching and learning far outweigh the limitations. Therefore, gamification proves to be an effective pedagogical approach in making Science instruction more interactive, meaningful, and learner-centered.

RECOMMENDATIONS

Based on the findings presented, the following are the recommendations of the study:

- **Integration of Gamified Materials in the Curriculum**
Schools should formally incorporate gamified instructional materials in Science lessons for Grade 6, especially in topics identified as difficult, to enhance student engagement and comprehension.
- **Teacher Training and Capacity-Building**
Regular professional development programs should be conducted to train Science teachers in designing and implementing gamified instructional materials effectively, including the use of digital tools and game-based strategies.
- **Provision of Resources and Support**
The Department of Education and school administrators should allocate sufficient resources such as gadgets, internet access, and educational software to support gamification in classrooms, especially in rural areas like Lucio O. Arquillano Integrated School.
- **Further Research and Monitoring**
Future studies should be conducted to assess the long-term impact of gamified learning across various grade levels and subjects, while continuous monitoring should be established to improve and adapt the materials based on learner feedback and performance data.

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BIONOTE

Maria Cristina L. Nudalo-Gonzaga is Associate Professor I of College of Technology and Engineering, Cebu Technological University – San Francisco Campus. She holds a Master's degree in Industrial Technology and gained her Ph.D.-TM Education and is currently pursuing her Doctor of Development Education. Her research interests include educational leadership, teacher development, community-based digital literacy and technology management. She has presented her work in local and international conferences and is actively involved in curriculum planning and accreditation efforts in her institution.