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TÍTULO DEL TRABAJO

Use of realia and game-based learning to improve vocabulary acquisition in students at rural multigrade schools

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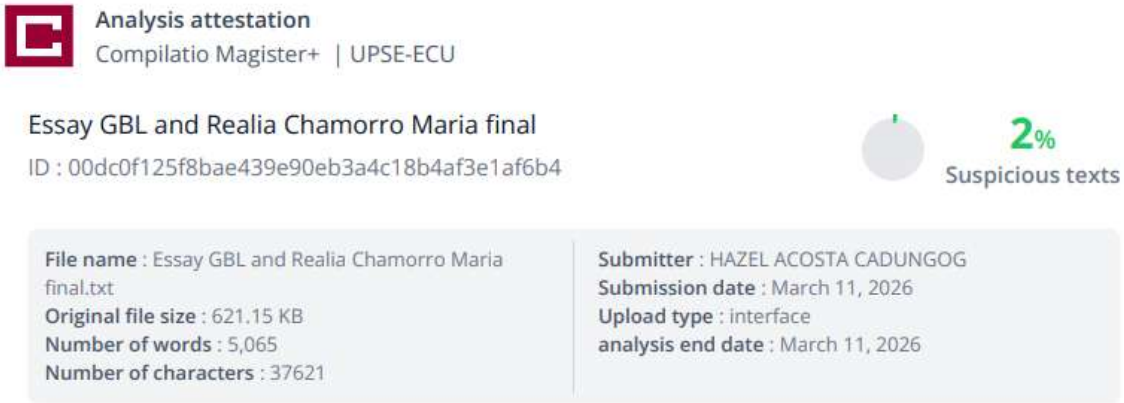

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María Fernanda Chamorro Lagos

DEDICATORIA

I want to share this achievement with my family, whose support has been my foundation. Most importantly, I dedicate this to my son. I hope this serves as proof to him that no goal is too distant and no dream is too high. If you set your mind to something and put in hard work, the impossible becomes possible.

María Fernanda Chamorro Lagos

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RESUMEN

Dominar el idioma inglés en la actualidad es una necesidad, al ser considerado la lengua franca global más extendida y al actuar como idioma puente en los negocios, los estudios, las investigaciones y la comunicación en general. Uno de los principales retos al aprender un segundo idioma y comunicarse con éxito es adquirir un amplio vocabulario. Una pobreza léxica impide que los estudiantes alcancen una comunicación fluida, generando temor y disminuyendo su motivación para aprender un nuevo idioma; este desafío se vuelve aún más intenso en la educación rural multigrado, donde la implementación de estrategias de enseñanza efectivas se ve limitada por la carencia de diversos factores, como recursos tecnológicos, infraestructura deficiente y acceso limitado a internet. En este contexto, el objetivo de esta investigación fue determinar el efecto del uso de realia y del aprendizaje basado en juegos en la adquisición de vocabulario por parte de los estudiantes de escuelas multigrado en zonas rurales de Julio Andrade. En consecuencia, se realizó una investigación de tipo investigación-acción que constó de 5 fases cíclicas, con evaluaciones pretest y postest para determinar si se produjeron avances significativos tras aplicar la metodología, así como la observación directa del docente para evaluar la motivación de los estudiantes. Los resultados revelaron incrementos de 2,33 a 4,63 puntos en la media, con puntajes entre 7,58 y 9,25. Se concluye que la metodología, realizada en sinergia con el aprendizaje basado en juegos, tuvo un impacto positivo en los estudiantes, fortaleciendo su repertorio léxico y reduciendo el bajo desempeño.

Palabras clave: adquisición de vocabulario, realia, aprendizaje basado en juegos (ABJ).

ABSTRACT

Mastering English today is imperative, as it is the most widely used global lingua franca, serving as a bridge language in business, academia, research, and everyday communication. One of the principal challenges in learning a second language and communicating successfully is acquiring a broad vocabulary. A limited vocabulary

prevents students from achieving fluency in communication, generating fear and reducing their motivation to learn a new language. This challenge is even more evident in rural multigrade education, where limited technological resources, inadequate infrastructure, and limited internet access constrain the implementation of effective teaching strategies. In this context, the objective of this research was to determine the effect of using realia and game-based learning on students' vocabulary acquisition in multigrade schools in rural areas of Julio Andrade. Consequently, an action research study was conducted in five cyclical phases, with pre- and post-test assessments to determine whether significant improvements occurred after applying the methodology. Direct observation by the teacher was also used to evaluate student motivation throughout the study. The results revealed increases of 2.33 to 4.63 points in the average score, with scores ranging from 7.58 to 9.25. It is concluded that realia, when used with a game-based learning methodology, had a positive impact on students, strengthening their vocabulary and reducing low performance among them in the study.

Keywords: Vocabulary acquisition, realia, Game-based learning (GBL).

INTRODUCTION

One characteristic that defines people is diversity, including the ability to communicate in other languages. According to the World Health Organization (WHO), there are an estimated 4,000 to 6,000 spoken languages worldwide. Among them, English is the most widely spoken language, both as a native and second language (Romero, 2021). Saltos (2022), language coordinator at the Pontifical Catholic University of Ecuador, posits that the acquisition of a foreign language offers numerous benefits, including access to international labor markets and access to information available exclusively in that language. That is why learning English at a young age is highlighted as a foundation for lifelong learning (Moreno, 2020).

According to the 2025 EF English Proficiency Index, Ecuador has low English proficiency. The country ranked 83rd out of 123 nations assessed, with a score of 466 points, which is below the world average (EF Education First, 2025). This metric demonstrates a regression in proficiency level compared to 2023, when the score was 467 points. Between 2011 and 2021, the statistics were similar, falling within low and very low English proficiency (De Angelis, 2022). Notwithstanding these figures, organizations such as the British Council emphasize the multifaceted advantages of early bilingualism, including improvements in social, work, and cultural skills, as well as health benefits, such as delaying the onset of degenerative diseases like Alzheimer's (British Council, s. f.).

Valencia y Velásquez (2021). assert that, to “achieve communicative competence and semantic clarity, a robust lexical repertoire is requisite; that is, the lexical component is fundamental for sustaining fluent production and complete comprehension during interpersonal interaction”. Similarly, Merdan (2026) states that vocabulary acquisition is one of the fundamental pillars for achieving proficiency in English. Accordingly, lexical acquisition and its pragmatic application within authentic sociolinguistic contexts are underscored. In educational environments, heterogeneous learning rhythms and pedagogical frameworks are prevalent, creating opportunities for improvement across various didactic areas and topics. It is necessary to implement strategic actions and

activities to provide better knowledge alternatives and facilitate learning by leveraging available technological and physical resources to maximize learning outcomes.

Ponce, J. et *al*. (2025) corroborate that integrating technology into pedagogy is necessary, as it helps teachers enhance learning and strengthen students' self-esteem, motivating them to persevere and improve their academic performance. However, most rural schools suffer from a considerable lack of connectivity and technological infrastructure. Padilla (2024) and Jiménez et al. (2025) state that rural education in Ecuador faces multiple challenges, among the most common being geographic dispersion, limited access to basic services, deteriorating school infrastructure, and limited internet connectivity due to a lack of technological equipment. These limitations widen the educational gap between urban and rural areas, thus marginalizing rural students. Given these inequalities, educators must propose and implement innovative strategies to achieve positive results in second language acquisition (Chiriboga & Zambrano, 2025).

As Ribadeneira (2020) mentions, "The educational process in rural areas is a landscape that requires examination, since the teaching strategies employed often do not contribute to the development of skills to cope with daily life" (p. 242). Given the infrastructural limitations inherent in rural education, it is necessary to adopt pedagogical frameworks that do not rely exclusively on digital infrastructure. In this context, game-based learning motivates students to use the language, improves their participation, and guides them toward meaningful learning. By implementing these strategies, teachers can reduce the fear and stress some students experience when learning a second language, thereby improving their academic performance (Ameliana et al., 2025).

Game-based learning (GBL) is an educational methodology that uses ludic activities to canalize motivation and increase student participation. This strategy can promote positive attitudes in students and facilitate the acquisition of the linguistic skills necessary for effective communication. (Hartte et al., 2020,) mentioned in Rajendran et al. (2024). Several authors, including De Smet (2024), Rajendran et al. (2024), and Lépinard and Vandangeon (2019), detail the importance of game-based learning in the educational

field as a support tool to improve pedagogical processes and facilitate the learning process by increasing the acquisition of skills set out in the national curriculum in planning. In the same way, Nurmanova and Komiljonova (2024) specify that: “By creating interactive and engaging learning environments, games motivate students to participate in language activities actively, leading to increased engagement and attentiveness” (p.8).

A complementary instructional approach is the use of realia, which involves incorporating authentic artifacts into the classroom (Lema, 2022). These objects enhance lexical retention, as their tactile and visual presence allows for lasting memory, making the learning process more enjoyable and increasing motivation and interest in learning and speaking English (Harmawan et al., 2019). However, most research on game-based learning uses digital approaches (e.g., video games), and none uses real objects for teaching English. Consequently, given the specific needs of the rural context, the objective of this research is to improve vocabulary acquisition among students in multi-grade rural schools in the province of Carchi through the synergy of realia and game-based strategies.

OBJECTIVES

General objective

- To determine the effect of realia and game-based learning on vocabulary acquisition in students in multi-grade rural schools.

Specific objectives

- To compare the data obtained from the three evaluated institutions before and after applying realia and GBL methodologies.

- To capture students’ feelings and perceptions of the influence of realia and game-based learning on motivation.

CHAPTER I. THEORETICAL BASES

Literature review

Currently, acquiring a broad vocabulary is essential for maintaining effective, fluent communication in English (Singh, N., 2025). Therefore, many studies have been conducted to improve teaching and learning, with a focus on enhancing speaking and listening skills in English as a second language.

In this regard, González and Álvarez (2022) conducted a systematic review to examine the didactic implications of using digital games for second-language learning in higher education. The databases used to search for information were Web of Science (WOS) and Scopus, selecting 35 and 9 articles, respectively. These articles were carefully reviewed to determine whether their content aligns with the research questions addressed in this study. In the end, after evaluating the best selected articles, it was concluded that the use of video games substantially increases the acquisition of new words.

Similarly, Yélamos-Guerra, M. (2022) conducted a study with primary and secondary school teachers across several Spanish regions to analyze teachers' perceptions of game-based learning (GBL) and to understand the benefits of implementing it. The teachers assessed perceived this methodology as a positive factor that directly impacts students' moods.

D'Santiago, (2023) carried out a bibliographic review in which he analyzed the mechanics and objectives of gamification and game-based learning to be placed in a meaningful learning educational environment, planning a solution that allows the use and association of these mechanics with a learning environment in the university, to improve and check the knowledge of students through web platforms and playful tools, where he concluded that these didactic strategies can be used profitably, as long as the game pursues the objectives set out in class, bringing academic training closer to the dynamics behind video games, where students can be motivated in their studies, foster healthy

competitiveness and guide them in the learning processes.

In his doctoral thesis, Caramé Fontes, (2023) evaluated the educational impact of game-based learning from the teacher's perception, where he establishes that the primary interest of students at an early age is playing, being able to use this opportunity as an advantage as an ally for learning, framing itself within the objectives that the Ministry of Education, Culture and Sport establishes: One of the key elements in competency-based teaching is to awaken and maintain motivation towards learning in students, which implies a new approach to the role of the student, active and autonomous, aware of being responsible for their learning. The author concludes that game-based learning offers benefits when implemented in teaching and supports the neurological development essential to growth during this stage.

Fernández Patiño (2023). Researched the play-based learning process in preschool students, highlighting the importance of play and playful learning at early ages, concluding that play is essential in the cognitive, emotional, social and physical development of children, that is, children learn better when they are involved in fun activities, improving social skills such as cooperation, problem solving and empathy, highlighting that the lack of playful activities brings disadvantages in the correct development-learning, limiting essential skills such as creativity, problem-solving ability and diminishing imagination.

Similarly, Bado (2022) conducted a literature review to examine teaching practices for integrating digital games into the classroom. The study examined how teachers used instructional activities, such as training, classroom management, and pre-game briefings, before, during, and after gameplay to ensure that learning objectives were met and student engagement was maximized. Bado concluded that game-based learning is a practical tool that should be consistently implemented and monitored. In contrast, Yaman, H. et al. (2024) concluded that game-based learning is not limited to digital games and can be implemented with any type of game, such as board or analog games.

On the other hand, Irawan (2017) conducted a quasi-experimental study on

teaching English vocabulary to seventh-grade students at Siswa High School in Palembang, Indonesia, using realia (real media). For this research, an experimental group and a control group of 40 students each were used, giving the two groups a pre-test and a post-test to observe the results obtained before and after the research, in the results it could be observed that the grades of the experimental group were higher than the grades of the control group, showing a statistically significant difference between the two groups, showing that the use of realia in teaching new vocabulary is effective.

Holguín and Manjarrés (2022) completed their thesis entitled "Realia as a didactic technique to activate the passive vocabulary of third-grade students in an IED in the subject of English" where after identifying the deficiencies in the learning of the vocabulary learned in previous classes, upon verifying that the language was not understood in an efficient way because the students did not remember it in the next class, for this reason it was proposed to apply the realia technique where the activities to be carried out in each session were planned, then the different activities to be carried out were carried out, it was observed in detail how the activities are carried out and finally the reflection phase was executed to determine if the activities carried out were effective or not, reaching the conclusion that third-year students managed to enrich and strengthen their vocabulary by easily recognizing the vast majority of objects used in class, in the same way it was concluded that this methodology helps increase motivation for learning the English language.

The background presented above concludes that game-based learning is a teaching strategy that improves learning if used appropriately, however, most of the research cited above uses game-based learning along with technology, that is, digital games, however, in many rural schools in Ecuador there are no digital resources or internet connection, which is why the use of game-based learning along with real objects in teaching the English language is proposed.

Theoretical basis

Realia

According to Carvajal and Flores (2022), realia is a didactic technique for teaching and learning English vocabulary through physical objects; this method creates a connection between real-life items and the vocabulary being studied. Similarly, Suárez Robaina (2021) states that the use of real materials, or "realia," as part of the pedagogical support used by teachers is characterized by being natural objects and authentic materials that the student can use in an inspiring way, thus associating these objects with the natural context for learning the English language. In short, realia is "a methodology that fosters an instrumental view of the target language by using it in a 'real' way, through continuous and constant oral communication that generates discussions and interactions around the objects."

Game-Based Learning

Game-based learning is a teaching strategy that, through play, can support learning processes aligned with planned classroom competencies. To achieve this, the teacher uses educational or playful materials and, through games, reinforces a particular topic or lesson (Trujillo, 2023).

Juan and García (2013) state that various authors have argued that game-based learning is a teaching strategy that supports learning processes aligned with planned classroom competencies through play. To achieve this, the teacher utilizes educational or playful materials and, through games, reinforces a particular topic or lesson. Psychologists and psychoanalysts have found that children are more motivated and engaged when they learn through play with real objects and images, rather than just through books or exercises. Using these materials in the classroom can help teachers boost participation and concentration.

Action research

As Peralta and Mayoral (2022) mention, action research is a reflective process in

which teachers seek to understand their practice and, through this understanding, implement improvements in the educational process as a strategy for transformation and continuous improvement.

Action research contributes to knowledge acquisition through data collection and the use of evidence-based on experience. Various researchers suggest that using action research as a teacher-training strategy helps identify factors that affect the teaching process and facilitates the identification of students' learning needs. As Caballero et al. (2023) specify, action research is a collaborative, teacher-student practical inquiry aimed at improving the educational environment through cycles of action and reflection grounded in practice.

Phases of action research

Rees, A. J. (2025). It specifies that action research comprises four cyclical phases, repeated as many times as necessary to achieve the desired results. Therefore, it is important to share what supported our initial theories and what did not contribute to the research. Within the phases of an action research cycle, there are multiple moments when errors can occur, serving as learning experiences that generate knowledge and drive continuous improvement.

Planning phase

The action plan begins with a general idea of how to change or solve a problem in the professional field. To do this, the problem must be identified, and then strategic action must be proposed to guide the investigative process and reduce or eliminate it (Torrecilla & Javier, 2011).

Action phase

In this phase, after diagnosing a problem that can be reduced or eliminated and developing an action plan, the plan must be put into action; in short, the action is the

realization of what was proposed, in order to collect data and verify if the changes made are valid and meet the objective of the research (Berrocal, E., & Expósito, J.2016).

Observe phase

It is considered one of the most important steps in action research; it focuses on action because, in this phase, all collected data are analyzed to determine whether the methodology used is viable (Torrecilla & Javier, 2011).

Reflect phase

Reflection involves applying potential solutions to the problem to achieve the expected results. It is important to note that if the proposed methodology cannot solve the problem, an action plan based on a new methodology must be implemented until the problem is truly resolved (Charapaqui & Jesús, 2025).

CHAPTER II. METHODOLOGY FRAMEWORK

Core strategy

The proposed intervention model is play-based and contextual. This educational strategy combines plays as a motivational tool with contextual learning, relating content to real-life situations. Its objective is to foster the holistic development of children, making learning meaningful, participatory, and adapted to their environment.

Proposal implementation

The action research study took place in three multi-grade rural schools in Carchi province. The research followed five cyclical phases, as described by QuestionPro (2025), to support learning-by-doing. Before starting, the necessary administrative steps were taken to get approval from the institution and informed consent from students' legal guardians. After approval, the first phase involved planning and designing an action plan to

address a shared problem in the school setting. In the second phase, a pre-test was given to set a baseline for the groups. The third phase was the action stage, in which the teaching proposal was put into practice through game-based learning with real-world objects (realia). The fourth phase included a post-test to assess the method's effectiveness. The final phase focused on reflecting on the method to suggest improvements and begin a new cycle of progress. According to Botella, A. and Ramos, P. (2019), these phases help improve teaching practice. Table 1 shows how many students from each school took part.

Quantitative and qualitative data were collected. The quantitative data consisted of the students' grades before and after using the proposed methodology, and the qualitative data referred to the teacher's perceptions across the three classes conducted, with data collected on a check sheet by observing the students' feelings throughout the classes.

The proposed methodology aims to improve teaching practices in English language instruction for students in rural multi-grade schools. Using tangible materials and games, it seeks to foster curiosity and increase interest in learning new words for everyday use.

Table 1.

Number of students in the participating schools

Educative Institution	***Number of students***
Educational institution I	6
Educational institution II	3
Educational institution III	4

Note: N= 13 (between 10 and 11 years old)

Data collection methods

Students' knowledge was assessed before and after the implementation of realia and GBL methodologies. The test was a multiple-choice questionnaire in which students identified the objects being evaluated across the three topics through writing, pronunciation, and listening comprehension exercises. Student behavior was also observed

throughout the class. An observation guide was used to record results and assess student motivation and the methodology's impact on their behavior.

Action research phases

Revelo et al. (2020) mention that. “Action research in education has produced significant changes that mark important differences in the ontological, epistemological, ethical, and methodological dimensions for approaching the object of study” (p.130).

In this context, the research conducted at three institutions was action research, with pre-test assessments to determine the proficiency levels of the evaluated students in the topics (fruits and vegetables, classroom objects, and clothing), and the use of real objects combined with game-based learning. Finally, a post-test was administered to compare scores and determine the influence of the methodology used. Similarly, observation notes were kept in each class to record student behavior, proactivity, and engagement, and to assess the methodology's influence on their mood.

Diagnosis

In this phase, it was observed that the students lacked extensive knowledge of the topics presented and did not use vocabulary appropriate to their age and level; they only knew basic words from lower levels. These results are shown in Table 2, with minimum and maximum values ranging from 2,5 to 7,5 points and an average of less than 6 points across the three evaluated topics. This result demonstrates the ineffectiveness of traditional teaching methods, as students did not achieve effective vocabulary retention, possibly due to a lack of motivation to learn.

The preliminary diagnostic analysis of this research shows significant variability in student performance. Topic 3 exhibits the most pronounced statistical dispersion, with standard deviations greater than 1.29 and scores ranging from 2.5 to 7.5, values far from the mean. These results corroborate a profound deficit, representing greater difficulty for students in this subject area (Ayeni, 2014). The topics 'Fruits and Vegetables' and

'Classroom Objects' showed relative consistency, notwithstanding the atypical performance observed at Educational Institution II during the initial assessment. The volatility of these statistical indicators underscores the need to implement disruptive pedagogical strategies to mitigate performance disparities and ensure equity within the educational ecosystem.

Table 2.

Statistical Data for Pre-Test

	Statistical Data Pre Test					
	Educational institution	**N**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**
Pretest 1	**I**	6	4	6,5	5	0,84
	II	3	4	7,5	5,5	1,8
	III	4	4	5	4,5	0,58
Pretest 2	**I**	6	4	5,5	4,5	0,63
	II	3	5	5,5	5,17	0,29
	III	4	4,5	5,5	5	0,58
Pretest 3	**I**	6	3,5	7,5	5,25	1,44
	II	3	2,5	5,5	4,33	1,61
	III	4	2,5	5,5	4	1,29

Note: N= 13 (between 10 and 11 years old)

Planning phase

A 55-minute lesson plan was developed for each proposed topic. Each lesson plan began with an opening activity in which the real objects to be used were presented. Students could see, touch, or smell them to connect the lesson with the objects. After this activity, the game corresponding to each topic was played, followed by teacher feedback. Finally, an evaluation was conducted after each lesson to compare the data obtained throughout the study.

Action phase

Each topic was covered in a 50-minute class. The first topic was fruits and vegetables, which was taught in week 1. The topics for weeks 2 and 3 were school supplies

and clothing, respectively. Each class began with a sensory presentation activity using the actual object, a practice activity involving games such as “Mystery Box”, “Teacher Says”, “What are you wearing?”, “Hangman”, and finally, a quick review activity with a concluding reflection.

Observation phase

Throughout the educational process, the teacher conducted individual behavioral observations of the students in the study to determine whether their mood was positive or negative. The results were compiled using checklists.

Similarly, at the end of the class, the students completed a written assessment to compare pre- and post-test data and determine whether there was significant learning and improved acquisition.

Table 3.

Statistical Data for Posttest

	Statistical Data Posttest					
	Educational institution	**N**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**
Posttest 1	I	6	7	10	8	1,14
	II	3	8	10	9	1
	III	4	7,5	10	9,13	1,18
Posttest 2	I	6	7	9	8,17	0,82
	II	3	7,5	9	8,17	0,76
	III	4	8	10	9,25	0,96
Posttest 3	I	6	7	8,5	7,58	0,58
	II	3	8,5	9	8,83	0,29
	III	4	7	10	8,25	1,26

Note: N= 13 (between 10 and 11 years old)

Critical reflection

The pre-test results from the three evaluated educational institutions showed standard deviations below 1, except for the topics of fruits and vegetables in Educational Institution 2 and clothing across all three institutions, with minimum scores of 2.5 and maximum scores of 5.5. These values demonstrate a deficiency in students' basic vocabulary for initiating or maintaining a conversation about the topic presented.

On the other hand, the post-test results showed standard deviation values above 1 for the topic of fruits and vegetables in all three institutions and for the topic of clothing in Educational Institution 2, with the difference that the minimum score was 7 and the maximum was 9.13. After verifying these data, a substantial increase in evaluation scores was observed, with scores moving from fair to poor, then to good, and finally to outstanding, with increases of 2.33 to 4.63 points across the three evaluated institutions. This data can be seen in tables 2, 3, and 4.

Teacher note-taking is important throughout the educational process. This is mentioned in the Primary School English Teacher's Guide: Toys and Games (s.f.). For this reason, observations were recorded and evaluated. The results indicated that students from institutions 1 and 3 were more motivated while playing, whereas those from institution 2 showed lower levels of proactivity and engagement during class. These results are explained by the larger number of students at institutions 1 and 3 than at institution 2. These results align with the conclusions of Peñafiel et al. (2025), who recommend using game-based learning in the classroom not only to facilitate learning but also to enhance social development among classmates.

Table 4.

Differences between pretest and posttest

Differences between pretest and posttest

	Topic 1	**Topic 2**	**Topic 3**
Educational_Inst I	+ 3,00	+ 3,67	+ 2,33
Educational_Inst II	+ 3,50	+ 3,00	+ 4,50
Educational_Inst III	+ 4,63	+ 4,25	+ 4,25

Moya, B. (2024) argues that the number of students in each classroom influences

class dynamics and the performance of a game; that is. The more students there are, the more social skills, such as collaboration and healthy competition, are strengthened, which affects the complexity and pedagogical approach of the activity.

On the other hand, according to research such as that by Arias et al. (2023), "various factors influencing student learning must be considered to determine the effectiveness of a given methodology. These factors include commitment, motivation, the methodology itself, emotional and economic factors, and health factors, among others" (p.10731). Therefore, it is important to consider the factors mentioned above when evaluating the effectiveness of research and drawing conclusions.

CHAPTER IV. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

It was determined that game-based learning, integrated with realia, has a significant positive effect on vocabulary acquisition among rural school students. This strategy not only improved academic performance—elevating average scores from an insufficient range of 4.0–5.5 to an excellent range of 7.58–9.25—but also effectively standardized student learning levels. The decrease in standard deviation values indicates that the use of tangible materials and play-based activities helps students improve their language skills when learning a new language (Zambrano, M., 2025). This data demonstrates the effective overcoming of learning challenges in multi-grade rural contexts

It was concluded that students' motivation in vocabulary learning using real objects and game-based learning was positively evaluated, as students showed greater motivation and engagement when learning new words. This change in teaching methodology boosted learning and transformed disinterest into motivation to learn and use new vocabulary in everyday contexts. By using this methodology, students overcame learning barriers, demonstrating the importance of motivation in the learning process.

Recommendations

Teachers are encouraged to permanently integrate the use of real objects with playful strategies into their lesson plans. Since the study demonstrated that using these resources raised the average grade of the three groups evaluated, reducing the learning gap for students in rural areas, their consistent application is important to maintain motivation and ensure that the acquired vocabulary is consolidated in long-term memory for use in daily communication.

It is recommended that this type of research be expanded to determine its scope and effectiveness in curriculum subjects where students typically experience greater difficulty. Hard sciences such as mathematics, chemistry, or physics could be an excellent setting for implementing this type of research to determine whether its impact is positive for adolescent students and large groups, and to observe whether the increase in motivation is equally significant in other disciplines, as demonstrated in this study.

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