

SUSTAINABILITY IN EDUCATION AND GAMIFICATION: STRATEGY TO STRENGTHEN READING COMPREHENSION IN COLOMBIA

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Summary

Faced with the need to identify alternatives that allow the achievement of the Sustainable Development Goals (SDGs), and specifically SDG 4, it is necessary to plan strategies that strengthen access to inclusive, equitable and quality education and promote lifelong learning opportunities for all. The objective of this research is to determine the effect of a pedagogical proposal based on gamification in improving reading comprehension. This study is qualitative, with research-action design. The population was made up of 19 students of grade 5 of primary school, in a city of Colombia, who were diagnosed through a pedagogical workshop that contained two entrance questionnaires housed in a Digital Educational Resource (RED), one of them identified the level of reading and the other allowed to establish their tastes and interests related to reading. Next, a proposal is designed taking into account the data obtained from the initial test, in which Ta-tum is established as a platform to host gamified activities. The application phase was carried out through 7 sessions that included the induction of access and recognition of the platform and 4 cases of gamified reading in which students had to solve the activities and accumulate points as literary detectives. The results show a significant improvement in the levels of literal and inferential reading, however, it is not possible to establish a demonstrative advance at the critical level.

Keywords: *sustainable development, SDG, gamification, reading comprehension, gamified reading, Ta-tum, pedagogical innovation, pedagogical strategy, communicative competence, connectivism.*

INTRODUCTION

In the 2030 Agenda, humanity has managed to agree on the need to achieve 17 Sustainable Development Goals (hereinafter SDGs) that constitute a clear and explicit roadmap with actions that



promote sustainability and resilience in the face of global economic, social and environmental challenges (UN, 2023). Given that education is a determining factor in the fight against poverty and is positioned as a driver of upward socio-economic mobility (Souza et al., 2020), SDG 4 "Quality Education" proposes to "ensure inclusive, equitable and quality education and promote lifelong learning opportunities for all" (UN, 2023).

This is all the more necessary due to the negative effects of COVID-19, which forced the closure of most schools, affecting millions of children who were out of school or were not reaching the minimum standards of basic skills.

For years, in Colombia has been implemented with great boom in educational institutions, different didactic strategies mediated by ICT to contribute to the improvement of education, especially motivation, interest and the teaching process that are factors that condition learning, before this teachers can implement pedagogical strategies as a reflexive and flexible action to achieve learning. (Díaz Barriga, 2013).

This research took as a reference the theoretical postulates of Díaz Barriga, (2013) who exposes pedagogical strategies as a reflective and flexible action to achieve learning based on pedagogical constructivism. The theory of connectivism of Siemens, (2004) who states that the possibility of involving our point of view with that of another person through various mechanisms such as technological devices, enriches knowledge and develops learning since there are multiple perspectives and a greater understanding of the subject is achieved. Emilia Ferreiro (2002) describes reading as an intelligent behavior and the brain as the center of human intellectual activity and information processing, Solé (1987) refers to the act of reading as a "process of interaction between the reader and the text, a process by which the former tries to satisfy (obtain relevant information for) the objectives that guide its reading" (p. 8).

Additionally, Ortiz Colón, Jordan, & Agredal, (2022) argue that gamification requires "incorporating strategies in their classes that increase motivation and commitment to provide all possible tools and resources that favor the autonomous and meaningful learning of their students" (p. 2).

Michavila (2009) states that educational innovation is "intimately linked to the motivation, training and evaluation of teachers" (Page 4) and teachers are the actors in the innovation transformation process.

Ferreiro, (2022), states that in the first years of education, language teachers must carry a series of problems that affect reading, this activity is defined as intelligent behavior and the brain as the center of human intellectual activity and information processing, this process covers multiple competences, but comprehension is sharpened, as the process of interaction between the reader and the text that leads to satisfy and obtain pertinent information with the purpose that guides the reading (Solé, 1987); The lack of reading habits or the predominance of traditional teaching practices are one of the triggers of this problem, as a possible solution in teaching practice, gamification is proposed as an innovative



pedagogical strategy that increases the motivation and commitment of students by providing tools and possible resources that favor autonomous and meaningful learning. (Ortiz Colón et al, 2022).

Romero (2021) establishes that reading comprehension problems bring with them emotional affectations in children such as frustration, self-esteem and as a direct consequence, school dropout. In addition, the lack of reading comprehension in students limits the development of other thinking skills such as critical and reflective thinking (Hoyos and Gallego, 2017). These limitations have also been observed in the third grade children of the I.E where the present research is developed.

Cairney (2018) states that reading comprehension must respond to legitimate purposes that arouse the interest of the child and that he learns to construct the meanings offered by the text, so that he can engage in a subsequent dialogue where he presents his points of view. In his research, Cairney (2018) establishes a very strong relationship between the image and the content of the text; It applies a reading strategy called Draw to expand from *Sketch-Tostrech* English and consists of the child using the images of a text to expand the understanding of it; in the same way, the images, graphics and other illustrations of video games help to expand the process of understanding the text.

THEORETICAL FOUNDATIONS CONNECTIVISM.

It is clear that learning based on the incorporation of new technologies supposes the premise of thinking that students are digital natives and although teachers are immigrants or natives in this aspect, they must respond and be trained in the high demand of technological and network societies that are immersed in the information and knowledge society, in the age of changing information coming and going from everywhere and in the ease of time and resources to access it.

In this sense, George Siemens (2004) in his theory of connectivism for the digital age states that to create a complete vision of a situation, an approximation of different points of view is required, since this generates a critical structure and an exhaustive review of the ideas that can cause innovation; In addition, the fact of promoting, nurturing and synthesizing the impacts of the different postulates are of vital importance to survive in the knowledge society (Siemens, 2004)

In other words, the possibility of involving our point of view with that of another person through various mechanisms such as technological devices, enriches knowledge and develops learning since multiple perspectives are had and a greater understanding of the subject matter is achieved; it is not an assumption to learn from these systems, it is attractive and effective since it is achieved in less time thanks to discussion and debate (Vadillo, 2011)

Taking into account the above, for George Siemens, (as cited in Levratto 2017), "learning is a process that occurs within diffuse environments of changing central elements, which are not completely under the control of the individual" (p. 94), which is why ICT is proposed for the strengthening of reading and



comprehension in children, Since, thanks to interconnection and hypertext, students can find in multimodal reading, a fertile space to connect all the elements that activate their thinking and allow them to find their reason for being in the face of the multiple situations that converge in the network. (Levratto, 2017)

GAMIFICATION IN THE CLASSROOM.

Gamification as the set of techniques that the teacher uses in the design of a learning activity, in order to enrich the experience and modify the behavior of students in the classroom can be according to Foncubierta and Rodríguez (2014) in an analog way as traditional instruction based on paper and pencil or digital, introducing game elements such as scores, badges, time limit, challenges, competition, etc. (Beil and García Jiménez, 2022)

Additionally, Ortiz Colón, Jordan, & Agredal, (2022) argue that gamification requires "incorporating strategies in their classes that increase motivation and commitment to provide all possible tools and resources that favor the autonomous and meaningful learning of their students" (p. 2).

It should be noted that the use of ICT and gamification are a powerful resource to improve the motivational difficulties presented by the educational paradigm at the national level, because of this teachers are in the urgent need to look for alternatives or interaction methodologies that stimulate student learning and that leads them to obtain and transform information in a fun and motivating way, However, teachers must be clear about the objectives to carry out gamified projects in the classroom, take into account the interests of students, the analysis of the context so that the teaching-learning process is meaningful and transformative.

It should be noted that within their training process students want to be taken into account, to feel that their opinion has value; they have the need to follow their interests, create new things with various tools, work in groups, share experiences, have control, compete and cooperate, so gamification would be the most appropriate strategy to meet these needs (Ortiz Colón et al. 2022)

Consequently, it could be said that Gamification is learning using the elements and techniques of the game in which the mechanics that are responsible for integrating the basic components of the game, its rules, its engine and its operation are found as a first step; secondly, there are the dynamics that indicate the way in which the mechanics work, which determine the behavior of the students, and are related to their motivation; Finally, the components cover the resources and tools available to design the activity. (Beil & García Jiménez, 2022)



Figure 31
Elements of Gamification.



Figura 2: Elementos de la gamificación²

Taken from Gamify: The Use of Game Elements in Teaching Spanish. Beil & García Jiménez, 2022.

In this way we can conclude that to carry out processes of educational innovation, it is necessary to reflect on pedagogical practice and be clear that since ancient times education and knowledge is carried out in a network, so the theory of connectivism gives us solid foundations to manage training projects that generate impact through the use of new technologies, the integration of ICT and the application of gamification in the classroom; All these elements work as a catapult of motivation and interest of students in their process of acquiring true meaningful learning.

Phases of gamification. According to Blázquez and Flores (as cited in Gonzalo Flores and Javier Fernández 2021), to implement a model based on gamification, two phases must be taken into account; The didactic phase, which is the first step in its design, here an analysis of the group must be carried out, then, according to these studies, the objectives, the contents and the evaluation criteria that allow measuring the learning of the students are established.

The gamified phase, this phase focuses on the choice and adaptation of some basic elements of the game that will be used such as narratives, players or teams, missions, challenges and rewards.

It is of vital importance to recognize that the gamified phase should not obviate the didactic phase, this would imply ignoring the true value and meaning of gamification that is "learn more and better" in addition the implementation of it would be a real failure. (Gonzalo Flores and Javier Fernández 2021)

On video games in the development of reading skills, Torres-Toukourmidis, *et al.*, (2016) establish that from 2011 a special academic interest was aroused for research in this field; however, they could not evidence studies related to early childhood education, thus warning that "the omission of the integration of recreational activities in the curricular program, opens a space of analysis for future research" (p. 45). Interactive games, by themselves, have a power of attraction, are synonymous with fun and it is very common that children, young people and adults find in them, interest and desire to play them. Interactive games generate a positive impact when integrated into education, it has even been the case that games like Minecraft¹ affect reading fluency in children with and without dyslexia



(Jiménez-Porta and Díez-Martínez, 2018). It has also been established that interactive games are a playful strategy used by teachers to improve reading comprehension (Castañeda *et al.*, 2020).

This research article presents a well-traveled route to reach the construction of a didactic strategy that has not been applied; It is available to those who wish to experiment in the classroom with a gamification proposal to promote reading comprehension skills in third grade students.

This research had as main objective the scope of a pedagogical proposal based on gamification that would contribute to strengthen reading skills at a literal, inferential and critical level, having as reference textual typologies according to the tastes and interests of students, in addition to contributing to the strengthening and development of communicative, social, affective and cognitive skills. ; was held at the Nationalized Educational Institution of Jerusalem, an official institution that offers educational services from preschool to eleventh grade and directs the teaching-learning processes from the humanistic pedagogical model. The population was 19 students of grade 5 of the Antonio Nariño Educational Institution - Colombia, who, through direct observation of academic processes, reflection with teachers and analysis of results of different tests in the area of language, identified difficulties in the process of understanding texts.

This research was proposed under a qualitative approach of action-participation design, the technique of observation and survey was worked using as instruments the field diary and the questionnaire; Four phases of work are related: The first phase, The diagnosis, two tests are carried out, one of reading comprehension and another of tastes and interests of the students in reading; the second phase shows the design of the pedagogical proposal based on the use of gamification, the third phase writes the process of application of the proposal in the gamified online reading platform called Ta-tum and finally in phase four, The effect of the pedagogical proposal process is evaluated.

The results allowed to elucidate the importance of applying a didactic sequence based on gamification and mediated by ICT to contribute to improving the processes of understanding, attention, motivation, autonomy and learning of students.

READING COMPREHENSION

By Emilia Ferreiro *at al.* (1982) (as cited in Altamirano 2003) "reading is a process of coordination of information from different sources, particularly from the reader and the text, whose ultimate goal is to obtain meanings" (p. 3).

In the same way, Ferreiro (2002) describes reading as an intelligent behavior and the brain as the center of human intellectual activity and information processing, also emphasizes that this process (reading) consists of 4 cycles: an optical one in which the brain controls the eye and directs it in the search for what it wants to find, a perceptual one that manifests itself in the reader's ability to quickly perceive what he wants to see, here it is important to highlight that the author states that "fast reading is satiated to high comprehension, not only because good readers can process perceptual input faster,



but also because they are efficient in using the least amount of visual indexes necessary" (Ferreiro, 2002, p. 24), for its part the grammatical or syntactic cycle requires the reader to know the units of the text and interrelate them, finally the cycle of meaning becomes one of the most important, because it is here where it is possible to group all the compendium that was formed during the 4 cycles, however this is not established only at the end, rather, it is constructed as we read and reconstructed as many times as necessary. This cyclical process begins again and repeats, only ending when the reading comes to an end or when the reader stops. For all the above, the reader is configured as an active and dynamic subject who uses all his conceptual and corporal schemes when trying to understand. (Ferreiro, 2002).

For the Brazilian pedagogue Paulo Freire (2000), reading has been a reason for reflection and he calls it a process that revolves around the analysis of the world that has surrounded the reader throughout his life, and that is part of his significant environment.

From this sense, Freire (as cited in Caviedes, 2013) states that "the act of reading is configured in a search to try to understand the social context by associating the school experience with the student's daily life" (p. 228). This is configured in several of the texts presented by Freire and is related to current educational situations, which require contextualizing teaching practice around the social, family, economic, environmental and cultural aspects (Caviedes, 2013).

On the other hand, Solé (as cited in Solé, 1987) refers to the act of reading as a "process of interaction between the reader and the text, a process by which the former tries to satisfy (obtain information relevant to) the objectives that guide its reading" (p. 8). This implies that whoever performs the act is an active agent who processes, scrutinizes the text and also has an objective that directs its reading. Likewise, Solé points out that the reading process has an interactive perspective in which the text, its form, its content, the reader, their expectations and their previous knowledge intervene, each of them aimed at the same objective: comprehension.

METHODOLOGY

TYPE OF STUDY

This research proposal was developed under the qualitative approach, with Action Research design, which takes non-numerical measurements as a way, uses data collection and analysis to refine the questions or reveal new questions in the process and focuses on a logic and inductive process of interpretative type, it is also related to a specific problem, in this case reading comprehension, likewise; It relates the diagnosis, categorizes the causes and consequences of the educational problem referred to in order to find solutions. (University of Research and Development UDI, 2018)

PARTICIPANTS

The participating population was counted as the fifth grade of the Nationalized FDI of Jerusalem, Antonio Nariño Headquarters, which is made up of 20 students where 11 of them are boys and 9 are



girls, their ages range between 9 and 12 years of age. They are very active, creative and dreamy children; They have the support of a member of their family for school counseling, but they lack greater commitment and dedication in the development of academic activities. Most of them are easily distracted and seek that the game is present in each of their activities causing distraction and often indiscipline in class. Their selection was made taking into account that at the academic level they are students who present a basic and high performance in the different subjects but have high weaknesses at the motor graph level because their letter is disordered with many spelling mistakes, omission and inversion of consonants; In the reading and writing process, 7 of the students have slow reading, the other 13 students have good decoding, read quickly, but lack further development of interpretive competence. Additionally, there is a remarkable taste for the use of technological tools such as Tablet, video beam, television and speaker in the development of reading classes, as opposed to the management of reading in physical text, however, they show empathy for collective reading.

MATERIALS AND INSTRUMENTS

The techniques and instruments used to develop in a determined and specific way the collection of information according to the qualitative research method were: the survey technique and the observation technique in its form of observation-participant.

SURVEY

The survey was based on collecting information through the use of two questionnaires; The first was applied through a digital educational resource with the aim of diagnosing the reading level, tastes and interests in reading that 5th grade students have; The second questionnaire corresponded to a reading comprehension test that was applied once the intervention process was completed in order to evaluate the scope of the pedagogical proposal.

NATURAL OBSERVATION

During the completion of the degree project, participant observation activities were carried out, intensifying during the pedagogical intervention phase, recording data corresponding to the variables of communication between students and teachers, behavior, interest and participation of students and the reading strategies used by teachers as well as literal, inferential and critical level of students, The information collected was analyzed and subsequently used as input to complement the reflection on the results.

PROCEDURE

The pedagogical intervention was carried out, through 4 phases that were developed taking into account the specific objectives. Phase 1: the diagnosis, lasted two months, during which time the instruments (questionnaires) of reading comprehension containing 6 questions (2 of literal level, 2 inferential and 2 of the critical level) and another of tastes and interests in reading were developed,



later they were validated and applied through a pedagogical workshop through a digital educational resource. The pedagogical workshop was held in a 3-hour session, then the information of the level of understanding and the tastes and interests in reading of the students was collected and analyzed.

Phase 2, the design of a pedagogical sequence was proposed to improve the process of reading and comprehension of texts through the use of gamification, the Basic Competence Standards (EBC), the Basic Learning Rights (DBA) were taken into account, 7 sessions were designed with a total of 29 hours of pedagogical work under the cognitive-constructivist pedagogical model, the Ta-tum platform was used as a gamified tool for online reading, initially the development of the sequence includes three sessions of explanation, induction, motivation, entry and management of the Ta-tum platform; The other 4 sessions include the workshops of comprehension of texts that are distributed as cases for the detectives (students) and their resolution through investigations that add points and serve to obtain medals.

Phase 3 corresponds to the application of the pedagogical proposal, which was carried out in face-to-face mode in the system room of the institution, tablets and the wifi network of the headquarters were used as technological devices to be able to carry out the practice. In the last phase, the effect of the pedagogical proposal was evaluated through the application of a second reading questionnaire and the analysis of data from the reading strategies observation sheet.

RESULTS

The findings of the initial reading comprehension questionnaire allowed us to recognize that 71.4% of students show difficulty at the literal level since they do not recognize the information implicit in the text, showing that only 28.6% handle this level of reading. As for the inferential level, an average of the correct answers was made, showing that only 17.85% of students manage to deduce, infer and extract implicit information from a text, while 82.15% of students lack these skills; At the critical level, 28.6% of students are able to make valuation judgments against what they have read, but 71.4% fail to identify perspectives and give an opinion on the purpose of the texts. After performing the intervention process and data analysis of the second comprehension questionnaire resulted in 55.4% at the literal level, at the inferential level they increased to 68.5% and at the critical level by 27%, Finally in table 1 it is shown that the percentage of the final result is equivalent to 26.8% of students increasing their skills in literal level comprehension; As for the inferential level, the group increased by 50.65% in skills of this type, while at the critical level they decreased by 1.6%.

Table 1.

Average improvement in reading comprehension questionnaires.

Reading levels	Initial test	Test final	% improvement
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Literal	28,6	55,4	26.8%
Inferential	17,85	68,5	50,65%
Critical	28,6	27	1,6%

With respect to the decrease in the critical level, the variables of the texts chosen in the two questionnaires were analyzed, reaching the conclusion that in the initial test a narrative text was handled, which the students prefer and handle, while in the post-test an expository text was worked on that was not taken into account in the pedagogical intervention; However, it can be affirmed according to what was observed in the intervention and reflected qualitatively in the field diary that the evaluation of the proposal was of great impact since it contributed to improve the literal level because the students easily identified the basic elements of the narrative and lyrical texts such as: names of characters, places and times of the story, characterization of the most important facts and actions, narrative sequences and other components present in the reading; At the inferential level, they drew conclusions more quickly and eloquently, managed to improve in the exercise of making deductions about the feelings and motivations of the characters, were able to link the situations of the text with their previous knowledge and express ideas regarding the subject addressed. As for the level of critical reading, the students had a hard time exploiting the force of conjecture. Given this, the MEN (Ministry of National Education, 1988) for a student to achieve this level must interpret a text from several points, starting with the semantic macro structure that refers to the total coherence of the text, in this sense, students managed to solve the research by creating coherent short texts, according to their age and the indications of the game; However, in terms of identifying the perspectives and opinions of both the sender and the receiver and their purposes, the students could not easily identify them, which extended the process of analysis, reflection and guidance by the teacher.

CONCLUSIONS AND/OR COMMENTS

The diagnosis allowed to find conditions that favored the improvement of reading comprehension and the teaching-learning process, through the use of gamification and various teaching strategies as essential elements to awaken the interest and motivation of students in order to enhance reading skills.

It was possible to implement a pedagogical sequence that strengthened the levels of reading comprehension, having as a transversal axis, gamification and the use of the Ta-tum platform.

A different teaching-learning space was proposed, aimed at awakening interest and motivation for reading and therefore the improvement of reading comprehension, taking up the fundamental principles of the game and transferring it to the academic context through a system of resolution of cases, investigations, points and privileges, which were aligned with the tastes and interests of the students through textual elements that favored comprehension and interpretation.


The qualitative design of this research allowed to approach intrinsically with the population generating criticisms and value judgments regarding their interests in the reading of texts, recreational activities and learning spaces.


Once the research task is completed, it can be emphasized that the work has shown the possibility of improving reading comprehension significantly in two of its three levels (literal and inferential), however, emphasis is also placed on a slight improvement in the critical level, this is evidenced in the analysis of results.


It was evident that teachers open to change and interested in using ICT in the classroom, can carry out projects based on gamification, which although it demands time, commitment, dedication, sense of belonging to their institution and students, love for their profession, in the end generates great results because this methodology can reduce stress levels, noise and bullying, classes become more enjoyable and the vocal wear of teachers is minimal, in addition the feedback and evaluation of the activities is immediate.

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