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GAMIFICATION AND TECHNOLOGY IN SCIENCE TEACHING: ENGAGEMENT STRATEGIES IN THE 4TH YEAR OF ELEMENTARY SCHOOL

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Karim Gonçalves da Cunha Mota , Diovana Aparecida dos Santos Napoleão[1]

ABSTRACT

This article describes an experience of applying gamification using the Kahoot, Wordwall, and Google Form platforms. For this study, gamification emerged as a promising strategy to engage students in a fun and interesting learning environment, encouraging reflective decision-making processes. It enabled the integration of technology in the teaching of Science in the 4th year of elementary school. Gamification activities were implemented in collaboration with elementary school teachers from a public school, leading to greater student engagement in the classroom. A study was developed that analyzed the platforms by integrating playful elements and quiz design into the students' learning process, reinforcing the need for adaptation and innovation in education. The results indicated significant improvements in student learning outcomes, reflected in active participation and improvements in assessments. The technology integrated into the Science discipline of the 4th year of elementary school, enabled the integration of students through strategies of creativity and dynamism to solve the situations experienced in everyday life.

Keywords: Gamification. Elementary School. Sciences. Information Technologies.

[1]E-mail: diovana@usp.br

1 INTRODUCTION

The concept of Gamification emerges in cyberculture in the midst of the context related to the interaction between human beings and digital games (Lévy, 1999). In the educational sphere, it consists of the use of game elements in non-game contexts, that is, the use of the logic of games applied to different social contexts. However, this approach is based on the logic of the game, associating strategies that involve solving problems and increasing the level of difficulty (Pimenta and Teles, 2015).

In the area of education, gamification is used in the educational field, with the intention of teaching specific content with a playful, interactive and dynamic approach. In this sense, it provides benefits for students who are motivated and instigated to learn a certain subject. Motivational development has been explored in several themes such as (Alcivar and Abad, 2016; Xi and Hamari, 2020): general knowledge (Morschheuser et al., 2017), medicine and education (Dichey and Dicheva, 2017; Koivisto and Hamari, 2019; Osatuyi et al., 2018). Gamification has been applied in education-related contexts, through different levels (Caponetto et al., 2014) and in various disciplines (Kasurinen and Knutas, 2018), demonstrating a more effective result in learning (Koivisto and Hamari, 2019).

Educational applications involving gamification have been developed in non-academic areas such as: language teaching (Duolingo) or software use (Ribbon Hero by Microsoft). Also noteworthy are other popular gamification applications such as Kahoot and Quiziz, which can be configured and used in a variety of subjects, considering elements of classroom games, without any effort.

However, it is verified that the use of Information and Communication Technologies (ICTs) in the teaching/learning process is a promising opportunity, making it possible to break barriers and paradigms in the educational area, as it considers a motivating element, in addition to facilitating the work of teachers. From a deeper analysis, it is observed that traditional teaching methods do not belong to the social reality and that the insertion of technological resources in the educational context enables the development of skills and helps in the understanding of the content (Carneiro, Nascimento, 2020).

With the insertion of technology in the school environment, intensified due to emergency teaching, making traditional classes, using expository methods (blackboards and chalk), tiring. However, it is necessary to use new strategies, since mobile devices are a tool in the daily life of human beings, facilitating access to information.

With the teaching of Science through the implementation of active methodologies, it is possible to arouse the interest of students and demonstrate that Science can be developed

in various ways, mainly through the connections established with the other curricular components (Medeiros et al., 2021).

Gamification is a tool capable of exploring various potentialities, both cognitive, social and cultural, in addition to promoting the interaction and participation of agents. It can be classified as a motivating element, involving students in the object of study and allowing critical reflection on the topic addressed in the classroom. In this way, it can be an alternative to minimize the difficulties in the teaching of Science and Mathematics, considering that it dynamically allows the use of educational games as an opportunity to review or learn concepts, acquire skills, competencies, changes in attitudes and socialization.

In the technological context, Pappert (1994) already understood that the computer, at the time considered the newest technological resource, could provide children, young people and adults with opportunities to discover and research according to their interests, transforming education in a playful way. However, it highlighted the challenge in changing the mentality of education professionals, which would require a total reformulation of the school curriculum.

According to Legaki et al., 2020 and Aini et al., 2019, gamification works as a motivational factor for the individual, contributing to their engagement in the most varied aspects and environments, being able to explore potentialities and qualities, both cognitive and social, as well as cultural, promoting the participation of agents in the learning process.

The present study analyzes the impact of the learning of students in the 4th year of elementary school in a qualitative and explanatory way, through the integration of gamification in Science classes.

1.1 GAMIFICATION IN EDUCATION

Gamification is based on the principle of appropriating the elements of games, applying it in contexts, products and services with the aim of creating experiences and motivations similar to those experienced when playing games, with the educational purpose of affecting the individual's behavior (Huotari and Hamari, 2017). In this sense, gamification aims to create this experience in different contexts, through the use of game mechanics or other game-like designs in the target environment (Deterding et al., 2011).

Over the past decade, research on gamification has affected a variety of domains dealing with education (Koivisto and Hamari, 2019), which are constantly evolving, incorporating the latest developments in information technology even in primary schools (Karpouzis et al., 2007). However, it continues to require commitment and persistence from students so that they can acquire in-depth knowledge. Therefore, gamification has been of

great interest to educators who use its potential to improve student learning (Dichey and Dicheva, 2017; Majuri et al., 2018; Koivisto and Hamari, 2019).

However, this potential has enabled a growing literature on the efficiency of the insertion of gamification in universities, but also in other academic contexts (Koivisto and Hamari, 2019; Seaborn and Fels, 2015) and on a variety of themes (Dichey and Dicheva, 2017; Kasurinen and Knutas, 2018), such as: information technology (Osatuyi et al., 2018), Mathematics/Science (Attali and Arieli-Attali, 2015).

In the educational field, games are used with the intention of teaching specific content in a more playful, interactive and dynamic approach. Bringing many benefits, as students are more motivated and instigated to learn the contents covered in the classroom. They provide learning in which the student is active, experiencing each step, rule, making mistakes and getting it right to achieve the objectives proposed in the game. It is a territory for experimentation, where the student can make mistakes, try again, even get it right, without the burden that one has "in the real world" in relation to the error. It encourages the participant to practice, learn from their mistakes and thereby acquire new skills and/or knowledge (Koivisto and Hamari, 2019; Majuri et al., 2018).

Gamification is considered a meaningful way of working, using strategies and mechanisms used in games in situations that are not games, so any institution has the possibility of applying this practice in its context that involves students and transforms teaching into something more captivating. Making students more interested and motivated, encouraging them to fulfill tasks with commitment and determination, and the contents to be learned are absorbed naturally. Because they do not feel "obligated" to learn, the knowledge is better experienced and becomes more meaningful, involving them in the activities because it is fun. In addition to developing various socio-emotional aspects, such as cooperation, competition, collectivity, autonomy and communication.

Approaching this way of working in the educational process is to consider the reality of the students, their experiences and motivations, allowing them to feel that they belong to the educational process and gamification strategies. Addressing the playful aspect for the educational context that stimulates the motivated and voluntary participation of students. Therefore, the technologies that allow the transfer of information quickly combined with gamification, constitute a set that enables the massification of the motivational process in education, reaching levels that were not possible before.

2 METHODOLOGY

2.1 PARTICIPANTS

The activities were carried out in a public school in the interior of São Paulo, involving a total of 20 students from the 4th year of elementary school I of basic education. The methodology applied to the respective class was associated with a qualitative and explanatory approach. The activities were carried out in accordance with the municipality's teaching plan and with the use of the textbook Ápis Mais – Editora Ática.

2.2 ACTIVITIES DEVELOPED WITH THE 4TH GRADE CLASSES

The activities developed with the 4th grade students are presented in Chart 1, relating the action associated with the topic addressed and the performance of the students in the classroom.

Chart 1 - Activities developed with 4th grade students

Steps	Topic presented in class	Student behavior
1	-Presentation of the activities involved in this study to the students.	-Presented some questions regarding the conduct of the activities
2	-Composition of the groups in the classroom and identification of the leader of each group; -The leader received an identification badge and the plates designated in A, B, C, D, E, None of the Alternatives, F (False) and V (True); -The first activity was associated with the Autódromo game and the questions were described with the help of PowerPoint and the students debated about the alternatives until they reached a consensus and the leader presented the card corresponding to the chosen answer. The answer is written on the board and at the end the score of each group was counted.	-The students positioned themselves in their respective groups and carefully identified the signs received; -The groups presented the answers, received the feedback, successively until the end of the gamification for the score count.
3	-Activity with the Autódromo game and the help of Kahoot, considering the application at the remember and evaluate level; -The application was made available on the digital board, containing 8 questions timed for 4 minutes and leaving 20 seconds to finish the groups that expressed their answers.	-The students discussed the correct answers and at the end of the time they raised the signs with the answers indicating the correct alternative.
4	-At this stage, the applications were Kahoot and WordWall, enabling the handling of the digital resource in which students search the internet for the *link* directed to the gamification elaborated in the aforementioned applications.	-The students carried out two individual activities, using one *chromebook* per student, enabling access to the digital resource.

2.3 DATA COLLECTION AND ANALYSIS

To analyze the perceptions about the experiences with the use of gamification, the Kahoot and Wordwall platforms, photographic records were made and the opinions of the participants were collected through an electronic form. The form contained questions related to the Science topics covered during the activities. In addition, open questions were included,

allowing students to share their perceptions about the presentation of content in the classroom.

3 RESULTS AND DISCUSSION

3.1 GAMIFICATION IN THE EDUCATIONAL ENVIRONMENT

During the pandemic period and the need to implement remote teaching, teachers observed through low performance that many elementary school students were disinterested and distracted. One of the greatest difficulties faced by teachers was the evaluation system adopted, as the standard adopted did not correspond to the new context in the classroom.

In this context, the lack of face-to-face interaction and the absence of participation in online classes through the platforms (Google Meet and Zoom) made the old method and partially inappropriate for the educational system. After the meetings between the principal, coordination and some teachers, the choice of Kahoot was the most appropriate due to its interactive characteristics and the ability to encourage learning in a playful way. However, it is noteworthy that not all teachers adhered to the active method in the school, due to the resistance of changes in the way teachers approach student learning.

Schons (2022) highlighted in his studies that the school should promote an environment that encourages both creativity and critical thinking, empowering students to explore their full potential and participate in the community proactively. In the educational area, gamification makes it possible to expand the elements of games to prioritize learning through interaction with the environment, technologies, and other people, increasing engagement and motivation in pedagogical activities. It is important to encourage students to reflect on the choice of different paths, through decisions to achieve possible results, promoting autonomy, so that the interaction with the virtual environment provides a meaningful experience.

This study was carried out in 2023 with the 4th grade class of elementary school I of a municipal school in the interior of São Paulo. The activities carried out with the application of gamification, presented below, in the teaching of Science used different resources in a qualitative and informative analysis, promoting student engagement and involving them in the learning of the contents covered in the classroom.

3.2 GAMIFICATION ACTIVITIES CARRIED OUT WITH THE 4TH GRADE CLASS

The gamification activities were carried out with the 4th grade class who showed interest in participating in the classroom. As they were informed from the beginning about the steps that would take place, there was an active participation in the discussions addressed in the classroom.

With the introduction of the gamification game, it was possible to observe the students' previous knowledge on the subject and continue the application of the activities. In all classes in the initial period , a script of how the activities would be carried out was presented.

In Stage 2, the following questions were applied in the classroom regarding the Autódromo game:

- (Q1) - Can all the water we find in lakes, rivers, streams or taps be consumed?
- (Q2) Drinking water can be defined as water suitable for consumption. What are the characteristics of drinking water?
- (Q3) - Water suitable for consumption is that which is free of substances and organisms that can bring diseases. This water that we can consume has some properties. We say water is colorless when?
- (Q4) - Water suitable for consumption is that which is free of substances and organisms that can bring diseases. This water that we can consume has some properties. When do we say that water is odorless?
- (Q5)- Water suitable for consumption is that which is free of substances and organisms that can bring diseases. This water that we can consume has some properties. When do we say that water is tasteless?
- (Q6)- What is cave-in?
- (Q7) - What are the causes (what causes) the collapse?
- (Q8) - Why was a part of the land covered with plastic tarpaulin? After discussing the aforementioned questions , it was possible to observe that the students were able to relate the theme addressed in the classroom with their daily realities, as presented in Chart 2.

Table 2. Survey of prior knowledge – Water and Land

Issues	Hits
1 - The available water is not always suitable for human consumption. Can all the water be consumed?	
A) True B) False	
2 - In the picture appears a sign written "drinking water". Is all water drinkable?	**4**
A) True B) False	
3 - Observe the figure. What is Cave-In?	**3**
A) It is when a mountain is formed.	
B) Landslide.	
C) Water slide.	
D) None of the alternatives.	

4 - What are the causes (what causes) the collapse?	**0**
A) Only rain.	
B) Different soil wear caused by the actions of man and nature.	
C) Only man-made actions.	
D) None of the alternatives.	
5 - Why was a part of the land covered with plastic tarpaulin?	**0**
A) To store rainwater?	
B) To dry the soil.	
C) To play slide.	
D) None of the alternatives.	

Source: Prepared by the author. Note: 4 groups of 3 students = 12/20 students

For the realization of Stage 3, including the Autodromo game based on previous knowledge about the proposal and with the help of Kahoot, it was possible to observe a competition process between the groups. At this moment, a discussion between peers on the questions was considered, and a collaboration was evidenced in the participation of students to convince each other of their choices through the arguments presented.

In Stage 4, the Kahoot and Wordwall applications were used, in which the students presented discussions about the topic addressed, making it possible to identify a greater number of correct answers in the questions. It was observed that the students were more interested in carrying out the activities, assimilating the content in a satisfactory way.

3.3 INDIVIDUAL ACTIVITY WITH KAHOOT: PLAYFUL TEACHING AND LEARNING

The development of individual activities were related to the issues presented in the Kahoot application, Chart 3, and it was possible to observe that the performance during remote teaching impacted the approach to the theme and contributes to the methodologies worked in the classroom. In this way, it was possible to review the contents in an interactive way, presenting it in a comprehensive way for the different types of learning.

The individualized teaching approach was related to the teaching-learning process, with its own characteristics and qualities. In this case, it was important to highlight some difficulties in this process associated with non-assimilation and understanding of the point during the presentation in the classroom. It was observed that at the time of solving the exercise, the students had difficulties in developing it, due to their absence from class and because they were not interested in studying the topics covered. In this perspective, it was possible to analyze the main difficulties of the students in the learning process and help them individually.

In this activity, endangered species in Brazil due to environmental preservation, climate change, predatory hunting and fishing, pollution, among other factors, were addressed. It was also highlighted that the Tamar project (Brazilian coast) has the mission of promoting the recovery of sea turtles, through research, conservation and social inclusion actions. After an analysis, it was observed the need to review the content and deepen the

content for a clearer understanding by the students. To complement the classroom activities, there were discussions about the importance of education associated with the preservation of marine life, ensuring strategies to protect the environment.

However, during the classes, it was observed that the participation of the students was compromised due to their absence. Thus, the engagement of these students in the activities proposed in the classroom was not effective, with a subsequent reduction in the number of participants.

Table 3. Individual activity carried out with 4th grade students with the Kahoot app

Issues	**Hits**
Quizz 1- Have you ever heard of the word extinction? In your opinion, extinction means...	
(a) Definitive disappearance of a species of living being	10
b) Disappearance of a species of living being for some time.	6
c) A living being that has changed habitat.	0
d) A species that is difficult to find in the forest.	4
No response	0
Quizz 2- Do you know the meaning of the word preservation? This word means...	
a) Series of actions with the objective of selling something.	6
b) Defense, safeguarding, ensuring the integrity of something.	9
c) A series of actions with the objective of earning something.	2
d) Series of actions with the objective of appearing on social networks.	2
e) Series of actions with the objective of selling something.	1
Quizz 3- Now that we know what extinction means, choose an animal that you believes it is endangered.	
a) Cow	1
b) Chicken	3
c) Crab	10
d) Macaw	4
No response	**2**
Quizz 4- Choose an animal that is not part of the endangered animals.	
a) Macaw	1
b) Monkey	3
c) Horse	10
d) Turtle	4
No response	2
Quizz 5- What actions cause the extinction of animals?	
a) Placing the animals in the zoo.	9
b) Deforestation, trafficking, hunting, fishing, and water pollution.	**6**
c) Storms.	2
d) Winds and rain.	2
No response	0
Quizz 6- Check the name of the animals, choose the one that is endangered.	
a) Horse	1
b) Rabbit	6
c) Camel	8
d) Pink dolphin	**5**
No response	1
Quizz 7 - Tamar Project: pays fishermen to preserve the spawning of Turtles.	
a) False, there is no Tamar Project.	1
b) The project exists, but it does not help in the conservation of turtles.	6
c) True, the Tamar project exists and carries out these actions.	**8**
d) False, there are no fishermen who help in the conservation of turtles.	5
No response	0

Source: Prepared by the author. Grade: 20/20 students

3.4 USE OF WORDWALL IN THE CONSTRUCTION OF INTERACTIVE INDIVIDUAL ACTIVITIES

This activity addressed the study of mosquitoes, viruses and bacteria with the Wordwall application, which made it possible to discuss with students about these organisms in an interactive and more dynamic way in learning. In this approach, it was discussed about diseases transmitted by mosquitoes, hygiene habits that prevent viruses and bacteria, the importance of water treatment steps, food produced by bacteria, among others. In the classroom, it was discussed with the students about the microorganisms that are gathered in organisms belonging to the most diverse groups, such as viruses, bacteria, unicellular fungi and protists.

The gamification approach using the Wordwall application was organized for 4th grade students, addressing the theme of microorganisms. The questions were applied in class, along with the number of correct answers recorded according to Chart 4 (Appendix 3).

It is important to highlight that the individual activity enabled the student to learn based on collaborative and cooperative strategies. Keeping attention and focus on learning in the classroom, in addition to using strategies to ensure that everyone relates the new concept to their previous knowledge, such as, for example, the formation of groups to discuss what was learned in the classroom.

Chart 4 - Individual activity for 4th grade students with the Wordwall application

Issues	**Hits**
Quizz 1**-** What diseases are transmitted by mosquitoes	12
a) Influenza, tuberculosis and sarapó	
b) Dengue, Zika and malaria	
c) Cancer, diabetes and asthma;	
d) Chicken pox, mumps and rubella	
e) Hypertension, arthritis and diabetes	
Quizz 2- What hygiene habits prevent viruses and bacteria?	
a) washing, feeding and exercising	
b) dancing, sleeping and drawing	
c) singing, watching, and jumping	
d) to play, study, ignore	
e) wash hands with soap and water	
Quizz 3- Microorganisms are tiny living beings that play important roles in our life, as these tiny beings can be seen.	11
a) Microscope	
b) Binoculars	
c) Magnifying glass	
d) Spyglass	
e) Microscope	
Quiz 4- Which food below is bacteria used for its production?	8
a) Pineapple	
b) Cheese	
c) Pear	
d) Lettuce	
e) Melon	
Quizz 5- What is the function of decomposers in a food chain?	4
a) They produce their own food from sunlight	

(b) Are primary consumers	
c) They remove material resources from the bodies of living beings	
d) They are the first living beings in most of the food chain	
e) They produce their own food from sunlight	
Quizz 6- Where does the water we receive in our homes come from?	12
a) From the supermarket	
b) From the factory and the clouds	
c) From the ocean	
d) Water treatment plant	
e) From the supermarket	
Quizz 7- Which of the following sequences correctly presents the typical steps of water treatment to make it drinkable?	1
a) Filtration, disinfection, storage and capture	
b) Aeration, heating, collection, disposal	
c) Collection, dehydration, sterilization and distribution	
d) Coagulation, decantation, filtration, disinfection	
e) Filtration, disinfection, storage and capture	
Quizz 8- What food is produced with bacteria?	9
a) Pasta, rice and beans	
b) Cheese, yogurt, fermented milk	
c) apple, banana and strawberry	
d) Chicken, fish, meat	
e) Chocolate, biscuits and ice cream	
Quizz 9- Choose another food that is produced with bacteria.	10
(a) Fermented milk	
b) Guava	
c) Chocolate	
d) Pasta	
e) Fermented milk	
Quizz 10- What is the main reason why scientists study the virus?	3
a) Create characters in microscopic stories	
b) Developing vaccines and treatments	
c) To understand how viruses can do things	
d) To learn how viruses can live without invading cells	
e) To learn how viruses can live without invading cells	
Quizz 11- Figure of a virus - The image is from...	10
a) Protozoan	
b) Mushroom	
c) Fungi	
d) Bacteria	
e) Viruses	
Quizz 12- Figure of a bacterium - The image is from...	7
a) Bacteria	
b) Viruses	
c) Fungus	
d) Mushroom	
e) Protozoan	

Source: Prepared by the author. Grade: 13/20 students

3.5 ELABORATION OF TRAINING ACTIVITY USING THE GOOGLE FORM

The training activity monitors students' progress throughout the learning process, seeking to offer feedback to adjust teaching and improve students' understanding during classroom activities. For this activity, a Google form was used, which made it possible to evaluate the students' learning through the topics covered in class, Chart 5. The Google form presents several uses and functionalities free of charge for public schools, providing agility in implementation and access to diversified educational tools.

The use of Google Forms in the development of the training activity represents a valuable resource for both the teacher and the students. This tool allows the creation of interactive, personalized, and easily accessible activities, promoting greater engagement of participants. In addition, the form facilitates the automatic collection and analysis of responses, allowing the educator to monitor student performance in real time, identify difficulties, and adjust pedagogical practice more effectively.

Another relevant point is practicality: Google Forms can be accessed by different devices, which expands the inclusion and participation of students. It also enables the use of different types of questions (multiple choice, essay, scales, among others), which enriches formative assessment by contemplating different forms of expression and understanding of the content.

During the formative activity, the students commented that they remembered the Kahoot and Wordwall games, confirming that they were engaged, through the stimulation of competition and challenge. It was observed that for this study the use of gamification contributed considerably to the participation of students to perform tasks that required concentration and performance, and can be used as an alternative to traditional learning assessment (Frota, 2020).

Table 5 - Results of the training activity for the 4th grade class

Questões	Número de acertos	Discussão
1 - Toda a água que encontramos como: nos rios, nos lagos, no riacho ou na torneira pode ser consumida?	8	40% dos alunos compreenderam que nem toda água pode ser consumida.
2 - A água potável pode ser definida como a água própria para consumo. Quais são as características da água potável.	11	52% dos alunos identificam as características da água potável.
3 - A água própria para consumo é aquela livre de substâncias e organismos que possam trazer doenças. Essa água que podemos consumir apresenta algumas propriedades. Dizemos que a água é incolor quando.	10	50% compreenderam o significado da palavra incolor.
4 - A água própria para consumo é aquela livre de substâncias e organismos que possam trazer doenças. Essa água que podemos consumir apresenta algumas propriedades. Dizemos que a água é inodora quando.	8	40% compreenderam o significado da palavra inodora.
5 - A água própria para consumo é aquela livre de substâncias e organismos que possam trazer doenças. Essa água que podemos consumir apresenta algumas propriedades. Dizemos que a água é insípida quando.	10	50% compreenderam o significado da palavra insípida.
6 - O que é o desmoronamento?	10	50% dos alunos compreenderam o que é desmoronamento.
7 - Quais são as causas do desmoronamento (o que provoca)?	09	45% dos alunos compreenderam quais são as causas de um desmoronamento.

8 - Após ocorrer um deslizamento, as pessoas cobrem o local com lona plástica. Essa atitude de cobrir o local que já iniciou um desmoronamento com lona, serve para:	12	60% dos alunos conheceram uma ação para evitar o desmoronamento.
9 - O que é erosão?	8	40% dos alunos compreenderam o que é erosão.
10 - O deslizamento é um fenômeno provocado pelo escorregamento de materiais sólidos, como solos, rochas, vegetação e/ ou material de construção ao longo de terrenos inclinados, denominados de encostas. Ocorre em áreas de relevo acidentado, das quais foram retiradas a cobertura vegetal original que é responsável pela consistência do solo e que impede, através das raízes, o escoamento das águas. [...] Para evitar tragédias com o deslizamento de morros, é indicado que se construa:	10	52% dos alunos compreenderam a importância de um talude para evitar deslizamentos.
11 - O que significa a palavra HÚMUS?	4	26% dos alunos compreenderam o significado de Humus.
12 - O solo possui camadas. Essas camadas são classificadas como:	6	40% dos alunos identificaram quais são as camadas do solo.
13 - O que é fossa?	6	40% dos alunos compreenderam o que é fossa.
14 - Existem dois tipos de fossas, quais são elas?	7	47% dos alunos identificaram os tipos de fossa.
15 - O que é esgoto?	9	50% dos alunos compreenderam o que é esgoto.
16 - O que são lençóis freáticos?	5	33% dos alunos compreenderam o que é são lençóis freáticos.
17 - O que são coliformes fecais?	6	40% dos alunos compreenderam o que são coliformes fecais.
18 - Escolha a alternativa em que existem apenas doenças que são transmitidas por água contaminada.	4	26% dos alunos identificaram as doenças que são transmitidas por água contaminada.
19 - Escolha a alternativa em que existem apenas doenças que são transmitidas por mosquitos que se desenvolvem na água.	7	47% dos alunos identificaram as doenças que são transmitidas por mosquitos que se desenvolvem na água.
20 - O que é saneamento básico?	10	52% dos alunos compreenderam o que é saneamento básico.

Source: Prepared by the author. Grade: 15/20 students

4 CONCLUSION

According to the results obtained in the activities carried out in the classroom and considering gamification in the learning process, it was observed an effective and autonomous participation of students in Science topics. The approach linked to the active methodology made it possible to experience situations related to abstract concepts, enhancing learning in a significant way. Even considering that the number of students

participating in each application varied as a result of absences and transfers to other schools. However, this condition did not impose losses on the development of classroom activities.

In a complementary way, Kahoot and Wordwall were used in classes and enabled learning in a playful and interactive way, offering contributions to the discipline that at times was not understood by the students due to the complexity of the subjects covered in the classroom.

The integration of technology in the Science discipline of the 4th year of elementary school made it possible to bring together students, who needed to use creativity, strategies and dynamism to solve problem situations, making classes contextualized and dynamic, enabling the learning process to be built collectively.

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