An Application of the Quizizz Gamification Tool to Improve Motivation in the Evaluation of Elementary School Students

Noe Manuel Quispe Ccoa, Maria Elisabeth Farfan Choquehuanca*, and Fabian Hugo Rucano Paucar

***Abstract*—The motivation of students in the evaluation is one of the most difficult processes in education because students face high levels of stress and anxiety previously, during and after the evaluation, even more so considering the situation that was experienced due to the COVID-19 health emergency. This research aims to apply the gamification tool Quizizz to improve motivation in the evaluations of Primary Education students. Mixed methods research was used in this project in order to systematically integrate quantitative and qualitative methods, was of 40 school children from state educational institutions, which carried out four processes to measure the levels of motivation in the evaluation. This paper demonstrated that students presented improvements in motivation levels and decreased stress levels due to use of Quizizz tool as an alternative in the evaluation.**

***Index Terms*—Gamification, evaluation, Quizizz**

I. Introduction

The digital revolution is rapidly changing the world and humanity is making more and more use of these technological tools which permit us to optimize many activities, the new generation of children called Millennial, are a generation who was born in the digital age, basically, with technology in their pockets, they were born in a world surrounded by information and communication technologies, so that, it is uncomplicated to adapt to any technological tool [1].

Owing to this new generation, many questions are posed about how to improve their education or what requirements to implement in order to obtain more knowledge with different learning styles which are being developed more and more, because of this, educational problems have arisen. Education is facing a new challenge, which requires a redesign according to the new necessities of students, applying new methods of teaching-learning and evaluation [2–4].

Educational assessment is an essential part of teaching and has been applied mainly to traditional way [5]. Most students feel different emotions when they are evaluated, these emotions can be generated by various intrinsic or extrinsic factors [6]. The confinement during the pandemic caused demotivation in students, reaching high levels of stress [7].

Motivation is the positive disposition to learn and continue to do so in an autonomous way [8]. There are types of motivation that allow a better understanding of students, this motivation can be extrinsic or intrinsic depending on the factors that encourage them to perform activities for satisfaction or commitment [9, 10]. The low motivation of students to learn and participate has become a fundamental problem in modern education as a result of digital revolution; according to many scientific research, this problem is not worked out applying traditional or conventional methods because they fail to motivate and engage students actively [11, 12].

As a result of this problem, the idea of using "gamification" as a technique to boost motivation and participation of students in the evaluation was born. This term was first used by Nick Pelling in 2002 [13], gamification is used to describe the type of connection that exists between the game and many other elements, but that allows one to catch elements of real life and through these elements feel emotions that are lived [14] in education, gamification means applying games in a didactic way that allow students to develop their critical thinking, activating their educational potential, making education more entertaining in order to boost motivation of students for learning and study [15, 16].

There is a wide range of technological applications that could be employed in formative assessment of students in quest of improving their motivation, making tuition more engaging [17, 18]. The present study aims to apply the Gamification tool Quizizz for the improvement of motivation in the evaluation of primary school students.

The motivation to conduct this research was due to the health emergency that we had to live because of COVID-19 lockdown, whereupon we began to use more frequently innovative learning tools for our students, all these components, which students confront, were analyzed such as stress, anxiety and the pressure they experience in traditional evaluations, we introduced the gamification tool Quizizz as an alternative to increase the levels of motivation to learn in students, seeking to lower the levels of stress and anxiety.

The paper is organized as follows: In chapter II, we review some research of major relevance within the area; In chapter III, a brief concept about gamification in the evaluation process is provided; In chapter IV we will describe the methodology applied in the research' In chapter V, the obtained results is performance and finally the chapter VI demonstrates the findings.

II. Related Works

In the following section, it is shown studies related to the topic of gamification in education.

Maraza [19] identified the influence of online gamification

Manuscript received October 5, 2022; revised November 8, 2022; accepted November 18, 2022.

Noe Manuel Quispe Ccoa and Fabian Hugo Rucano Paucar are with Faculty of Education Sciences of the Universidad Nacional de San Augustin de Arequipa, Peru (e-mail: nquispecc@unsa.edu.pe, frucano@unsa.edu.pe).

Maria Elisabeth Farfan Choquehuanca is with Faculty of production and service of the Universidad Nacional de San Agustín de Arequipa, Perú.

*Correspondence: mfarfanc@unsa.edu.pe (M.E.F.C.)

tools such as Kahoot and Quizizz in the learning feedback process of high school students, the researcher performed two preceding evaluations on technological knowledge and then kept on evaluating the mentioned technologies, that through the Quiz tool, students show a greater response to feedback learning compared to the Kahoot tool, with that tool, a greater hardship in the learning feedback process. In Fernández-Vega *et al.*'s study [20], research was carried out in medical students applying the Kahoot tool, obtaining a result of 8.4 out of 10 points acceptance.

Laura did a research where she sought to determine the findings of the level of text comprehension in English with the content of the educational platform "Aprendo en Casa" and the Quizizz platform [21]. The same was done by Heredia in her research in [22], where she sought to investigate technological tools as strategies for learning disciplines, using the Quizizz tool. Both yielded favorable results and with a level of acceptance of the Quizizz tool exceeding 68% approval by students.

Karen Zavala applied Quizizz as a didactic strategy of gamification for learning by competencies in the students of the virtual course of cultural history [23]. For her research she took a population of 500 students, achieving, as a result higher achievement of students with a superb level. It was also demonstrated this tool achieves a better disposition of the student to express their doubts and queries, allowing them to overcome obstacles and emotional tensions.

The research was carried out to determine the level of motivation in students in the learning process. Gutierrez focuses on the implementation of three real-time assessment tools: Kahoot, Plickers, and Quizizz [24], whereas [25] works with the Kahoot tool. As a result, both yield in high levels of student motivation; according to Gutierrez [24], students showed a notable preference for Kahoot and Quizizz.

Zainuddin [26] investigated the differences in student performance. Furthermore, she worked with two types of pedagogical intervention: traditional tuition with paper questionnaires and gamified instruction with Online Gamified Quizzes as formative assessments. In regarding with gamified instruction, three types of gamification applications were run: Socrative, Quizizz, and iSpring Learn LMS, as a result of the study, all methods were applied satisfactory to student performance, however, the application of gamification was happened to be a challenge.

III. Gamification in the Assessment Process

A. Gamification

The term "gamification" refers to the use of games for better insight into various areas [27]. In education, gamification is the application of games in a didactic way that allows students to develop their critical thinking, activating their educational potential, and making their learning process more enjoyable [15, 16]. The Gamification seek to make the complex tasks, which often cause us stress, such as evaluations, straightforward to provide a fun learning and boost motivation levels [28, 29].

In the educational context, gamification is being used as a learning tool in different areas and subjects as well as the development of collaborative attitudes and behaviors seeking autonomous study [30, 31]. As applied by Gutierrez in [24] using the Plickers tool to determine the motivation of his students.

B. Assessment

Educational evaluation is a continuous and personalized process within the teaching-learning system whose objective is to know the evolution of every student, if necessary, to adopt reinforcement or compensation measures to ensure the educational objectives defined for their level [32]. Ortegón points out that the reward systems applied in the evaluation processes such as grades and badges increase the commitment of students, so that, by taking on challenges, the participant feels involved to be recognized for his or her achievements, generating motivation when performing this evaluation process [33].

In the primary educational institution I.E.P Virgen Morena de Jasna Gora in Arequipa, the Quizizz tool was applied as an alternative to traditional evaluation, seeking to reduce the levels of stress and anxiety that students present, at the same time increasing their levels of motivation to achieve autonomous learning. The application yielded great results, as shown in the conclusions of this research.

C. Quizizz Tool

The Quizizz tool is a website which permits us to create online quizzes that our students can answer in three different ways: live game, as homework and individually [19]. Quizizz includes some improvements unlike other websites to create "quizzes", which makes it very useful in the educational field, and motivating for students.

Compared to other online assessment tools such as Kahoot, Socrative, Plikers, Cerebriti, etc., they are also tools which demonstrate great efficiency for being gamified, playful, and especially digital, which is what best suits the context of the students. Quizizz not only has greater versatility to handle various areas, but it also allows you to know the low and high knowledge that students handle (when the statistics of certain questions are very low or very high).

The platform allows the creator to have a detailed report of the percentage of people answering a certain question, as shown in Fig. 1 as an example, high percentages are observed in question 3 and low percentages in question 4, which allows the creator to verify which question and the reference of the topic could reinforce or incorporate some improvement.

Fig. 1. Report of statistics that Quizizz provides when evaluating [19].

IV. Methodology

The study was conducted using the mixed method. The

mixed methodology is defined as the combination of qualitative and quantitative methods, allowing to do in-depth research data collection, analysis, and validation [34, 35].

A. Data

For this research we worked with two focus groups, having a total of 40 primary school students from state educational institutions. We considered the quantitative approach of 40 students as this is the average number of students per section in the state school.

The qualitative approach to this group of students because they are in a state school where there are fewer technological resources and the use of them is not common, this group, is our study population, which participated in every of the stages of evaluation with the Quizizz tool, the students are of medium socio-cultural and economic level, in the same way, informed consent was requested from each student.

The data were gathered through four processes: 1) the Academic performance test in the area of history with the Quizizz tool where the evaluation checklist was applied, 2) the Student participation scale [36] 3) the Hamilton stress test, and 4) Educational Motivation Scale test [37] adapted to our research in both cases of the tests. All these collected data were processed using SPSS and Excel to determine the necessary statistics.

B. Instruments

Checklist: This is an assessment tool that details the criteria to be followed to solve a given learning activity and the indicators effectively that allow us to observe that these criteria have been achieved. The checklist allows us to assess a student's knowledge and performance from the teacher's point of view by observing how the student performs and handles the Quizizz instrument [38, 39].

Student Involvement Scale: It was developed by Günüç and Kuzu [36]. For our research, an adaptation of the test developed by Günüç and Kuzu was carried out. The scale includes factors such as valuing, sense of belonging, cognitive engagement, peer relationships, peer-teacher relationships, and behavioral engagement. This scale was adapted for the research in which the student can respond in 4 ways:

1→I do not agree	2→Indifferent	3→Agree	4 →Strongly agree

Hamilton stress test: Hamilton's test was carried out to determine the level of stress presented in the students in the assessment, to determine whether the level of stress is higher or lower in traditional assessments compared to the gamified assessment by applying the Quizizz tool. The test which was applied, is an adaptation of the research [40] furthermore, was applied to determine the level of depression and anxiety of university medical students.

Educational motivation scale: The educational motivation scale was adapted from the following research [41], where they applied the EME motivation scale to students to analyze their educational motivation, which consists of 28 Likert-type items for our evaluation, where the three types of motivation were evaluated: Intrinsic Motivation (IM), Extrinsic Motivation (EM) and amotivation as shown in Table I. The items were divided as follows:

IM to knowledge □ (# 2, 9, 16, 23).
IM to achievements □ (# 6, 13, 20, 27).
IM to stimulating experiences □ (# 4, 11, 18, 25).
EM regulation identified □ (# 3, 10, 17, 24).
EM Regulation Identified □ (# 7, 14, 21, 28).
External EM regulation □ (# 1, 8, 15, 22).
Amotivation □ (# 5, 12, 19, and 26)

TABLE I: EME - 28 REASONS WHY I ATTEND SCHOOL (ADAPTED FROM [41])

Educational Motivation Test			
Goal: measuring students' stress levels.			
1→I do not agree	2→Indifferent	3→Agree	4→Strongly agree
1.Because it helps me to be able to apply for a good university.			
2. Because it is a pleasure and satisfaction for me to learn new things.			
3.Because I think that going to school will help me to have a better future.			
4. Because I make my ideas better known to others.			
5. I honestly don't know, I feel that this is not for me.			
6. Because of the satisfaction I feel when I do well and pass my exams.			
7. To prove to myself that I am capable of achieving many things.			
8. To have a prestigious job in the future.			
9. For the pleasure of discovering new skills in me.			
10. Because it will allow me to discover what I like later on.			
11. I like reading interesting books			
12.I don't feel confident to keep studing			
13.It is a challenge for me, but I manage to overcome new obstacles every day.			
14. Because passing the courses makes me feel important.			
15. Because I want to have a prosperous life in the future.			
16. Because I love learning more about the courses I like.			
17. Because it would help me to make a better choice of my professional orientation.			
18. Because I feel comfortable, and I feel that this is what I want.			
19. I only attend because of commitment			
20. Because I feel satisfied when I achieve difficult activities.			
21. To prove to myself that I am an intelligent person.			
22. Because my parents say that if I study I will live richly.			
23. Because my studies allow me to learn interesting things.			
24. Because I believe that every day I will be better and I will be able to compete with others.			
25. Because I like learning and knowing everything.			
26. I feel forced to go to school because my parents insist.			
27. Because school makes me feel good when I achieve what I set out to do.			
28. Because it is a challenge for me, I know that I am capable of succeeding in my studies.			

Focus group interviews: 5 questions were asked as a data collection technique for the qualitative study. Two focus groups were conducted to analyze the positive approach and the negative approach in order to have an overview of the advantages and disadvantages. These questions aimed to determine the students' opinions on the evaluation of the positive or negative effect of the Quizizz tool.

V. ANALYSIS AND FINDINGS

After carrying out each of the tests with the students, the following results were obtained: The students carried out the theoretical assessments with both assessment methods: The traditional assessment and the playful assessment with the Quizizz tool. The scale that was used for the analysis of the surveys carried out on the students is the comparative scale [42] In the comparative scales, the student is asked to

compare the traditional assessment with the playful assessment using the Quizizz tool.

Applying the checklist to the traditional assessment of the students, 55% of the students did not manage to solve the questionnaire in the established time, 70% did not manage to give clear answers and the average pass rate of the students was 60%, the results are shown in Table II.

TABLE II: CHECKLIST IN A TRADITIONAL EVALUATION

CHECKLIST			
Goal: measuring the level of motivation of students during the evaluation			
Criteria	Weight	Yes	No
Did the student manage to solve the questionnaire within the deadline?	5	45%	55%
Did the student manage to give his or her answer clearly?	4	30%	70%
Did the student manage to get a passing grade?	1	60%	40%

Applying the checklist to the evaluation carried out by the students using the Quizizz tool, we obtain that 70% of the students succeed in solving the test in the time limit, we observe there is a 25% difference in students who manage to solve the evaluations more quickly with the playful tool contrasted to a traditional evaluation.

40% of the students were able to communicate their answers clearly, and compared to a traditional assessment, there was a 10% difference in students who transmitted their answers with greater confidence, and the passing grade in students is 75% with a difference of 15% compared to the traditional assessment. We observed major differences in the preferences of students during the assessments (see Table III).

TABLE III: CHECKLIST AFTER THE PLAYFUL EVALUATION USING QUIZIZZ

CHECKLIST			
Goal: measuring the level of motivation of students during the assessment.			
Criteria	Weight	Yes	No
Did the student manage to solve the questionnaire within the deadline?	5	70%	30%
Did the student manage to give his or her answer clearly?	4	40%	60%
Did the student manage to get a passing grade?	1	75%	25%

The design of the student participation test seeks to obtain information on the valuation, sense of belonging, cognitive commitment, relationships with classmates and teachers and behavioral commitment that students present or feel within their educational environment. The following information was obtained and is shown in Table IV.

Ten questions were made based on motivational issues, where it can be understood from the results, in regard with the questions where students feel motivated to relate to their classmates and teachers, 50% of the students stated, indicating that they relate comfortably and they feel motivated. Nonetheless, prevail a percentage of students who express some misgivings about interacting with their classmates and teachers, but this percentage decreases when the interaction is through the gamification tool Quizizz, which encourages them to reduce their doubts about learning.

With regard to question 8, which seeks to see the student's pressure during a face-to-face assessment, 47% indicated that they feel this pressure from the educator in an assessment with the Quizizz tool, whereas in a traditional assessment, the pressure from the students is much greater, reaching 95%, indicating a feeling of pressure.

TABLE IV: COMPARATIVE TABLE OF THE PARTICIPATION SCALE

Participation Scale - Student Compliance Percentage		
Criteria	Traditional assessment	Playful assessment
1. I have got many friends at school	50%	50%
2. I like meeting new friends at school.	40%	60%
3. I participate in school activities.	75%	80%
4. I am motivated to learn.	30%	60%
5. I try to do my best in every lesson.	50%	70%
6. I set myself my own learning goals	45%	80%
7. I believe that my teachers are competent in their fields	80%	90%
8. I feel pressure from the teacher's presence during assessment.	95%	47%
9. I believe my courses are beneficial to me.	60%	65%
10. I respect my classmates.	100%	100%

As can be seen in Fig. 2 and Table IV, this playful tool allows students to participate in their own learning processes, on the other hand, the pressure they feel in a traditional assessment by the teacher is a very high percentage reaching 95% compared to 47% in an assessment with Quizizz.

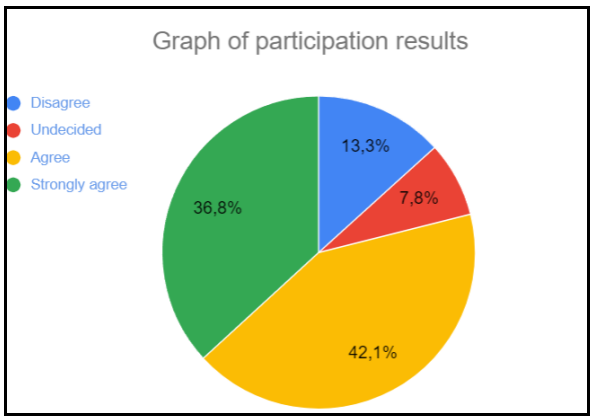

Fig. 2. Student participation scale.

The Hamilton test seeks to identify the level of stress of students in the academic environment. As shown in the images, approximately 50% of the students show stress, anxiety and fear before taking an assessment with a playful tool, compared to 80% in a traditional assessment, and this is owing to the pressure they feel from teachers and their parents.

Students report the assessment determines their intellectual capacity, generating certain levels of stress, which increases when the assessment is face-to-face, as

shown in Table V. The levels of stress that students present during an assessment are lofty, taking into account this assessment is face-to-face, these levels increase, a reason why the playful assessment with the Quizizz tool is proposed as an alternative, bringing these stress levels down and generating greater confidence in the students and their abilities.

TABLE V: COMPARATIVE TABLE OF THE HAMILTON TEST

Participation Scale - Student Compliance Percentage		
Criteria	Traditional assessment	Playful assessment
1. I am afraid of making mistakes during the assessment.	80%	65%
2. I feel comfortable in the way I am assessed on the theoretical content.	30%	100%
3. I insecure before doing an assessment.	90%	60%
4. I feel stress because of the degree of difficulty of the assessment.	80%	50%
5. I am afraid of getting a failing grade	80%	80%
6. I am afraid of being told off by my parents or teachers when I have a failing grade.	60%	60%
7. I feel satisfied with my grades.	40%	70%
8. I feel pressured by the teacher's presence during the evaluation.	95%	47%
9. I am afraid of failing the course.	60%	65%
10. I feel that an assessment determines my intellectual ability.	90%	90%

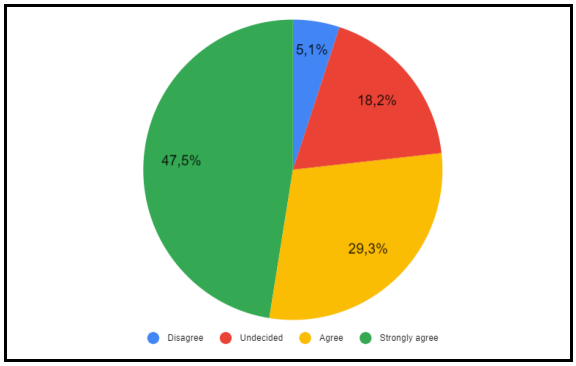

Fig. 3. Hamilton test.

When applying the test to determine the motivation of students in their educational environment, as shown in Table IV, it was identified that students present a 50% agreement with IM, whereas the percentage is lower for EM reaching 20%, where they feel motivated or influenced by their parents, as shown in Fig. 4.

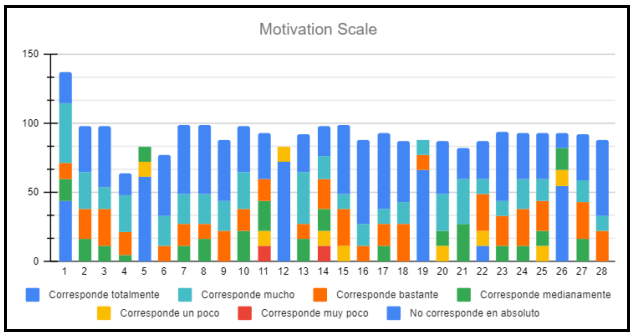

Fig. 4. Motivation scale test.

In the focus group interviews, students expressed their outlook, regarding the type of assessment they prefer. Considering Quizizz tool as an entertaining way of learning, considering the low level of stress that students present in a playful assessment. These results are shown in Fig. 5. It is observed that the students are very much in agreement with the use of the Quizizz tool.

TABLE VI: QUESTIONS ASKED TO FOCUS GROUPS

Questions				
1. Is your opinion of the Quizizz tool for evaluation a good one?	2. Do you think the elements of the game motivate you to take the test?	3. Do you feel using the Quizizz tool for the assessment gain confidence to take the test?	4. Would the Quizizz tool help you learn more about the test topic?	5. Do you prefer the Quizizz tool to a paper test?

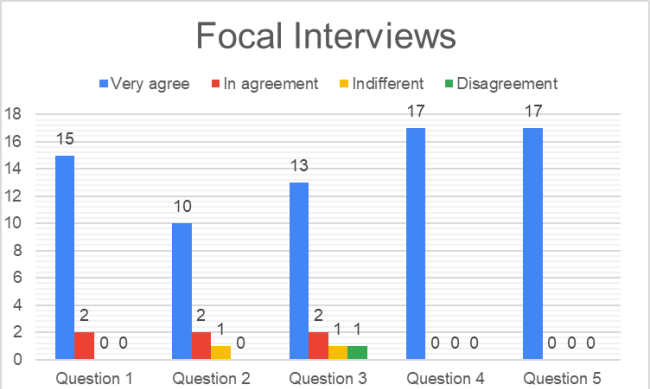

Fig. 5. Focal interviews.

VI. CONCLUSIONS

After carrying out the evaluations and analysis, it is concluded that: Students demonstrated they feel motivated to a high degree during the assessment when applying the Quizizz tool.

We sought to carry out an profound analysis of how students feel about the subject of assessment and found high values, which could be considered alarming, due to approximately 50% of students suffer from stress before an assessment and if the assessment is face-to-face, this feeling is even major, of course the level of stress of students also depends on the context of the assessment, depending on whether it is a partial or final assessment.

Although students feel motivated in their schools because of the communication they have with teachers and classmates, feeling the high pressure from their parents in their academic training makes them feel frustrated when they are evaluated. We believe that presenting the Quizizz tool as an alternative assessment tool, we will boost confidence of student, stimulating relaxation, because it is a playful and gamified method. And as shown in the results, students feel highly comfortable with this tool, enabling their assessment environment to be more comfortable and stimulating a comfortable demonstration of their knowledge.

We use Quizizz as a substitute for traditional assessments, which permit us to make a formative assessment of what our students are learning and to intervene in the process when we

detect "gaps". It is one more evidence of the many that we take into account when evaluating both students' learning and the teaching process itself. This tool can be adapted to all levels of students and can motivate learning. It also enables us to know in statistics the subject that requires more learning and to be able to deepen the study approach appropriately.

Our results are congruent with the results obtained by other authors when analyzing the quizizz tool as shown in the related works section, in these investigations favorable results were obtained and level of acceptance of the Quizizz tool and having improvements in the qualifications of these students and allowing them to analyze in a specific way the statistics of the evaluations.

Education and technology go hand in hand, so we must be in constant innovation, every generation of students is different, and their education has to be in line with their abilities. Countless technological tools exist which allow us to enrich the education, motivating them to carry out further research in the field, considering that we are in the era of e-learning.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Fabian Rucano supervised the development of the experimental described in the article, as well as supervised the methodology applied to the data collected. Noe Quispe developed the material to collect the data for analysis. Elisabeth Farfan performed the analysis of the statistics obtained.

The literature review, analysis, and writing of the article were conducted jointly by all the authors.

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Noe Manuel Quispe Ccoa was born in the city of Arequipa. He is a primary school teacher. He has a bachelor's degree in educational sciences from the Faculty of Educational Sciences of the National University of San Agustin de Arequipa.

His research interests are evaluation and gamified education. In the development of the research, the constant search for related works participated, and in the evaluations made to the students during the research development process, finally the analysis of conclusions.

Elisabeth Farfán was born in the city of Arequipa, Peru. She has a bachelor's degree in systems engineering from the Faculty of Production and Services of the National University of San Agustin in Arequipa. She has research interests are gamification and TICs. He carried out the analysis of the data obtained regarding the evaluations carried out, the interpretation of graphs and the analysis and interpretation of conclusions.

Fabian Rucano is a bachelor in educational sciences and in journalism. He received a bachelor's degree in secondary education with a specialty in physics and mathematics, completed a master's degree in educational sciences with a specialty in higher education and a doctorate in education. His research by him is on education, TICs and gamification. In the development of the research, the constant search for related works, the methodology used and the evaluations carried out on the students during the research development process, finally the analysis of conclusions, participated.