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IMPLEMENTATION OF A GAMIFIED EDUCATIONAL SYSTEM WITH THE PURPOSE OF TEACHING CHILDREN THE CORRECT USE OF FINANCES

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ABSTRACT: The implementation of a gamified system for children has been created to demonstrate that the traditional educational model should not be the only way to teach new concepts to children, in this case, financial concepts, with the aim of promoting the use of gamification for children's education. The research involves a continuous evaluation of 30 school children, aged between 10 and 12 years, before, during, and after the application of the game. Surveys were conducted to assess the children's knowledge and the concepts they were grasping throughout the process. The results and discussion address the comparison between the initial and final results obtained, evaluating the main financial concepts adopted by the children. The research aims to directly relate gamification to the possibility of teaching and acquiring financial knowledge. The final section presents a discussion with other studies conducted and applied for the same purpose, demonstrating the validity of the proposed gamified model implementation

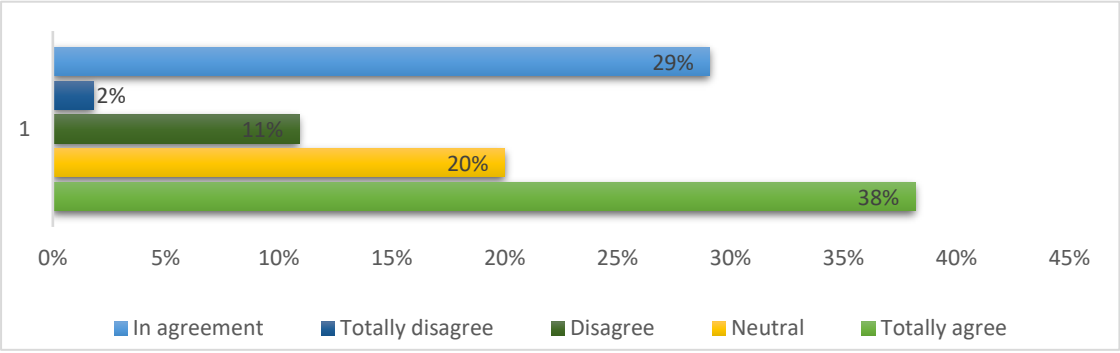
Keyword: *Gamification, Financial Education, ronbach's Alpha, Learning through Games, Financial Concepts.*

INTRODUCTION

In the last 10 years, education has undergone technological changes (Bucchiarone, Martorella, & Colombo , 2022. The current generation develops some skills through electronic devices (Bucchiarone, Martorella, & Colombo , 2022) (Xiangping, 2021). However, over the years, the teaching methods employed by the state have become increasingly distant from children, and gamification has emerged as a tool to help achieve learning objectives (Baldo de Faveri, Kroetz, & Valentim, 2023). One of the gaps identified within the digital learning framework is financial education (Herrero Vázquez, Torralba Burrial, & Del Moral Pérez, 2020).

Gamification is a tool employed to teach in a didactic manner, aimed at keeping children engaged with the information provided (Naresh Bhatt & Chakrabarti, 2022). Additionally, to encourage children to undertake activities beyond their comfort zone, the application focuses on aligning with values of trust and motivation within the educational framework to address their inquiries. Didactic activities have been utilized for years as instruments to enhance the learning of basic mathematical problems, such as addition or subtraction (Bucchiarone, Martorella, & Colombo , 2022).

Figure 1. Satisfaction level of children with the use of gamification for teaching design concepts (Values



expressed as percentages). Adapted from: Gamification of Design Thinking: A Way to Enhance Effectiveness of Learning

Children do not recognize the financial system, the types of investments to make with saved capital, or the benefits that banks can offer for saving money. Additionally, it is acknowledged that in Latin America, less than 12% of students understand the functions of a credit card (Hurtado Cuenca, Tacuri Peña, & Merchan Valarezo, 2021). In Peru, 46% of children have a lower understanding of financial principles compared to the global average (Superintendencia de Banca, Seguros y AFP (SBS), 2015).

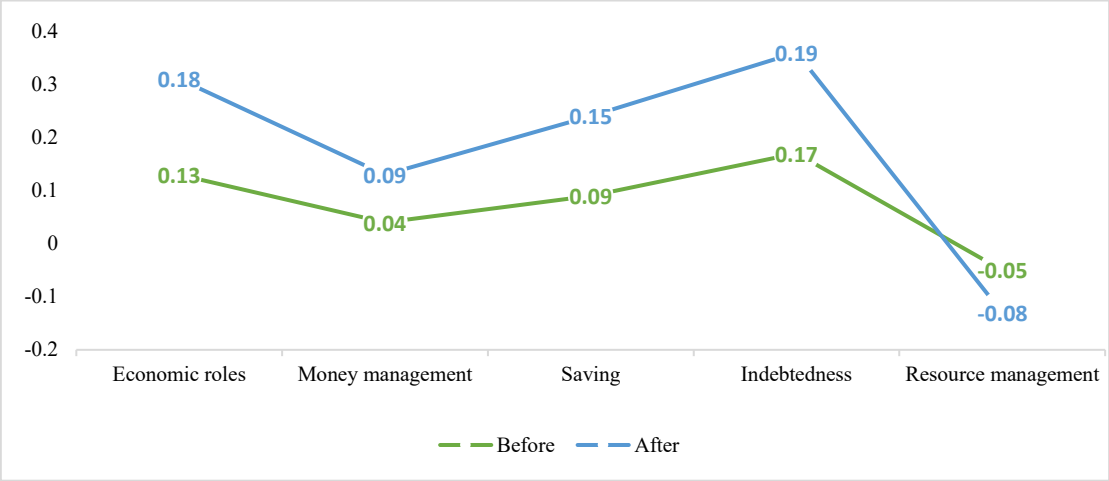


Figure 2. Background of financial knowledge in Peru. Adapted from: Superintendency of Banking and Insurance of Perú (SBS, 2021)

Given these circumstances, the gap in financial education has been addressed by linking it with gamification to teach children about the tools they can use, focusing on regulation through programs that assess debt levels and reduce financial fraud (Aleksandrova, Alikperova, Vinogradova, & Nenakhova, 2020). The implemented program was based on connecting concepts with the teaching of non-coercive activities, so that participants in the program realize that taking out loans does not obligate them to accept the high interest rates offered by financial institutions—one of the main issues also affecting the Peruvian population, where 2.5% have a high delinquency rate, largely due to the mismanagement of their finances (Banco Central de Reserva del Perú, 2022).

To motivate children and educate them about finances, gamification is the ideal tool (Naresh Bhatt & Chakrabarti, 2022). This tool can be applied in various ways, but the most effective approach for children involves games and scenarios that, through the modification or adaptation of topics, offer some form of reward to the participant. Reeves and Read (Reeves & Read, 2009) identified that for the use of gamification, tools such as avatars, levels, or competitions within games can be employed to determine which users have understood or not the rules of the game, how they have excelled within it, and which areas need direct reinforcement with the children (Pérez López & Navarro Mateos, 2022).

To educate students, a gamification program was created—a game that covers the ABCs of basic finance for children aged 10 to 12. This age range allows for the rapid assimilation of information that interests them in their development as adults and aligns with their attraction to digital games (Xiangping, 2021).. The gamification program involves three to four levels, depending on the age of the user. Various sources have documented the implementation of gamification in literary education (Naresh Bhatt & Chakrabarti, 2022) and others based on the sciences (Naresh Bhatt & Chakrabarti, 2022), but there is a need for a focus on children and finance to academically develop the skill of managing income through playful learning.

The objective is to demonstrate that the application of gamification enhances financial learning in children. Given the current state of financial education, the following question arises: How does the application of gamification improve financial literacy in children?

METHODOLOGY

The application of technological tools presented in this work aims to improve the financial education of the evaluated children. One demonstrated case shows that gamification is effective, revealing that children learn and expand their knowledge through didactic and playful means (Herrero Vázquez, Torralba Burrial, & Del Moral Pérez, 2020).

Similarly, gamification has been implemented in other areas, such as design education (Naresh Bhatt & Chakrabarti, 2022). In this study, digital tools were employed to help children develop cognitive skills that enable them to understand instructions and apply what they learned in the game to their academic activities (Hainey, y otros, 2014).

To develop the game, participants must first take a preliminary exam that introduces various financial concepts, such as types of savings, credit types, and interest rates (Ying, 2016). After this procedure, user accounts for the children who will play on the platform are created. Once the results are obtained, a comparison of before and after can be made, and the impact of the platform using gamification on financial education can be determined (Tsarapkina, Vaganova, Lapshova, Koldina, & Sedov, 2021).

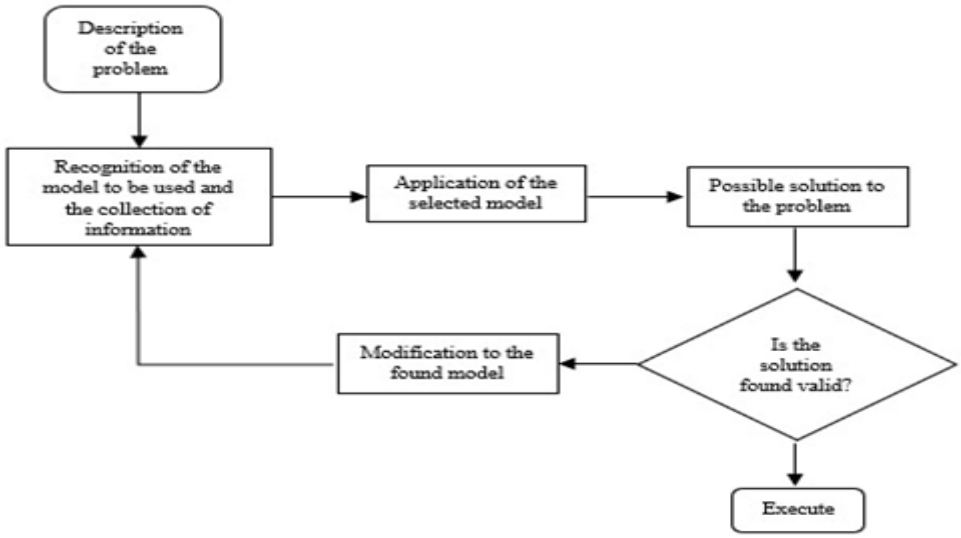


Figure 3. Methodology used to implement the financial model

With a structured approach to implementing gamification, this research includes a sample of sixth-grade students from the Breña district in Lima. The sample consists of 30 children from a middle socioeconomic background. The group is composed of 15 boys and 15 girls from a coeducational school who were surveyed to determine their understanding of financial principles and their monthly expenditure.

To demonstrate and test the reliability of the survey, the Cronbach's Alpha tool was used (Merino Soto, 2018). To consider the survey reliable, the variance range must be between 0.6 and 0.8. Therefore, the following formula was employed:

$$\alpha = \frac{K}{K-1}\left[1 - \frac{\Sigma V1}{Vt}\right] \quad (1)$$

To assess the reliability of the survey, a result of 69% reliability was obtained, indicating that it falls within the acceptable range for utilizing the survey data (Novak , 2020). Additionally, to analyze the survey results, a graph was created to identify the trends present in the data. For questions 1, 3, and 5, which had Yes/No answers, values of 0/1 were assigned respectively. For questions 2 and 4, which had responses in ranges, values from 0 to 4 were assigned to optimally calculate the variance when developing Cronbach's Alpha (Alkhadim, 2022).

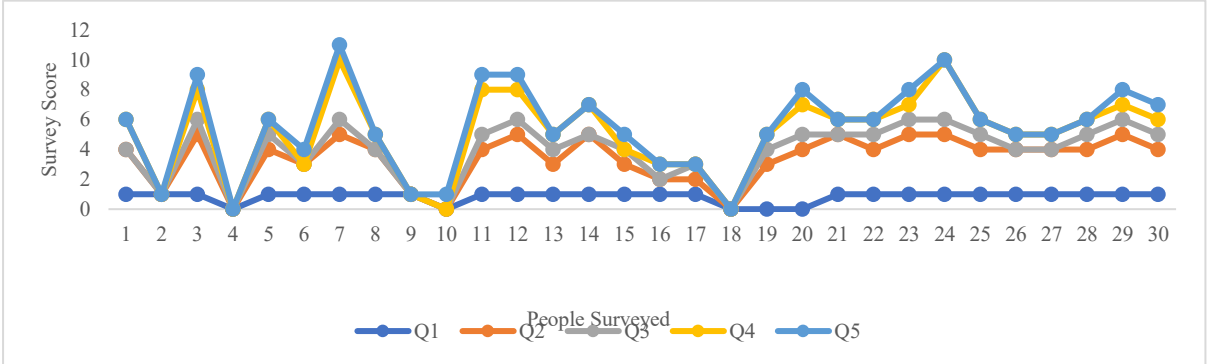


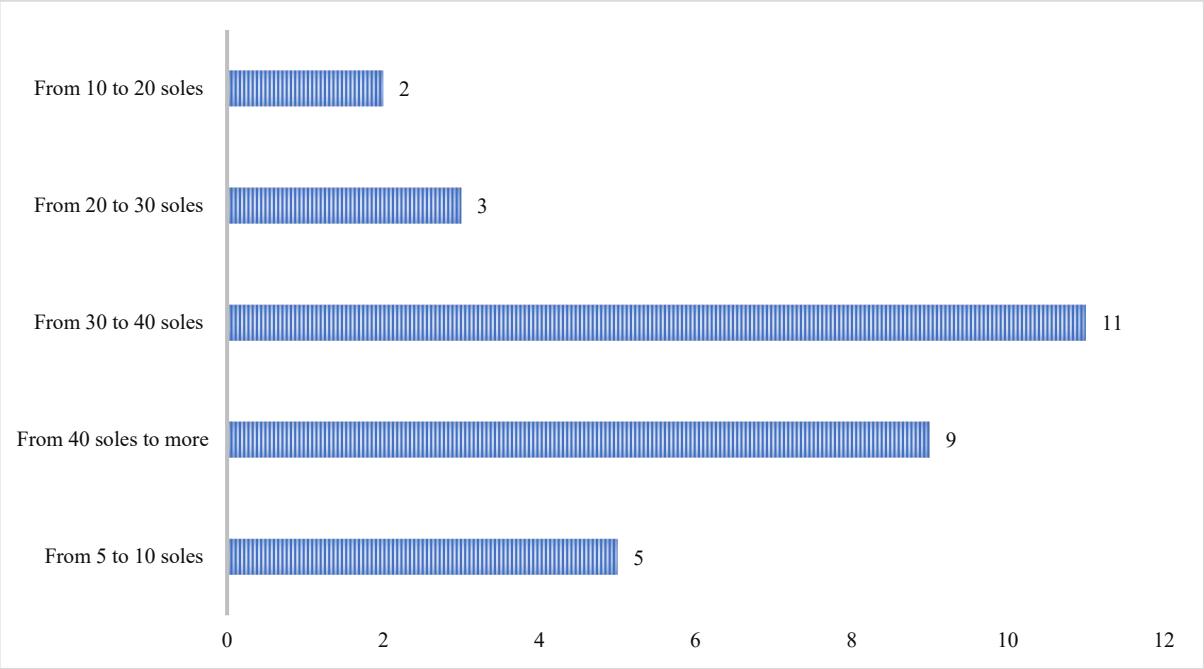
Figure 4. Survey Results To detail the obtained results, a table was created outlining the exact figures found within the graph.

Table 1. Data from children analyzed

Children who recognize receiving money from their family members	27	90%	**30**
Children who recognize not receiving money from their family members	3	10%	
Children who acknowledge that they save money	17	57%	**30**
Children who acknowledge that they do not save money	13	43%	
Children who recognize understanding what saving is and its purpose	11	37%	**30**
Children who recognize not understanding what saving is and its purpose	19	63%	

The table shows that 90% of the surveyed children receive money from their parents or a family member. Among this group, 57% acknowledge saving money in a type of piggy bank to purchase toys or popular games. Additionally, 63% of the children in the sample recognize that they do not understand what saving is or its purpose. With this collected information, the aim is to implement the gamification method so that children learn the basic concepts of finance and use this tool to effect future changes in the financial landscape of Peru.

Figure 5. Ranges of amounts of money children receive based on survey of children.



This graph illustrates the ranges of money that children receive from their parents or relatives. These data have been entered into a table to statistically determine the monthly frequency at which the game can be implemented to foster a culture of financial learning through gamification.

Table 2. Search Equations in Databases

N°	DATA BASE	SEARCH EQUATION	DOI
1°	Web of Science	"Crombach´s Alpha" Refine: Open access + Publication 2020 or 2021 or 2022 or 2023 + Aricle	https://doi.org/10.21865/RIDEP57.4.14
2°	Scielo	"gamification" AND "financial management "AND "learning"	https://doi.org/10.5565/rev/ensciencias.2806
3°	EBSCO	"gamification "AND "financial management" AND "learning"	http://dx.doi.org/10.3991/ijet.v11i09.6117
4°	SCOPUS	"gamification"AND "design education"	https://doi.org/10.3390/s23010545
5°	ProQuest	"gamification" AND "financial education"	10.15838/esc.2020.4.70.10

In the development of the research and alongside the strategies taught to narrow the search to directly related research articles, the following selection criteria were applied:
Given that education is constantly evolving and teaching methods are advancing continually, the selected articles are from the last 5 years, containing relevant information for this research. Articles related to financial education and the implementation of gamification in children have been crucial for filtering and classifying information as useful for our study.
In the selection of references, theses and non-certified or non-indexed academic repositories were not used, as shown in Table 1. This is due to the relevance of the information found in this language across various databases like Scopus. International articles were preferred because education is a global issue, and gamification is a tool being used worldwide to introduce learning to younger audiences.
The selection of sources has enabled the research to establish a foundation related to its main topics, effectively eliminating irrelevant information.

RESULTS AND DISCUSSION

In the development of the analysis for the game designed for application, research was conducted on the key concepts that can be taught to children of that age to ensure quick comprehension (Aleksandrova, Alikperova, Vinogradova, & Nenakhova, 2020) (Hurtado Cuenca, Tacuri Peña, & Merchan Valarezo, 2021). Additionally, several studies employing gamification (Pérez-López & Navarro-Mateos, 2023) or games (Garza Puentes, Castañeda, & Rodríguez, 2022) related to finance or accounting for children were identified.
The tool used to design the game was inspired by memory games and tools already employed in schools and higher education institutions to interact with students (Magadán Díaz & Rivas-García, 2022). With this tool, students can be divided into groups; in this case, they were organized into groups of six, creating five groups interacting and debating the terms they are asked to recognize and whether the concepts provided are appropriate or not.

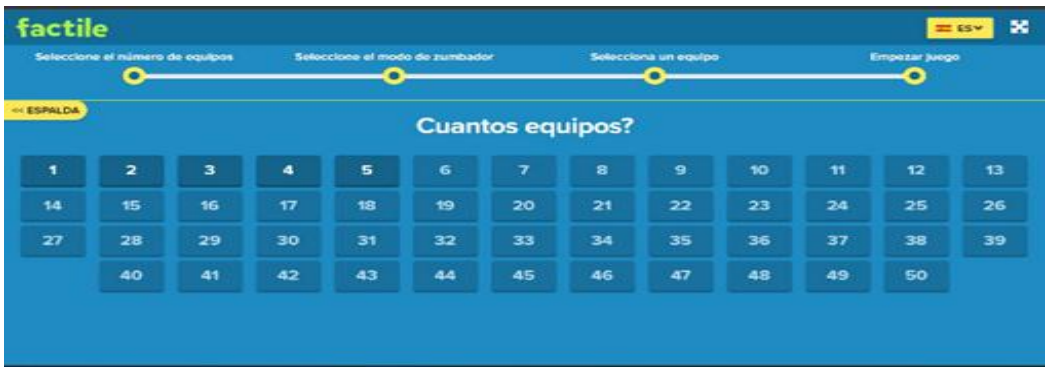


Figure 6. Main window that appears when opening the game link: https://www.playfactile.com/lo26fpn2eb/play
After selecting the number of teams to participate in the game, a name was chosen to represent each group of students, and the number of coins earned by answering questions was tracked under this name

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Figure 7. Window showing participants, the amount of money accumulated for correct answers, and the remaining unanswered questions

During the execution of the game, an interaction survey with three questions was conducted to measure student satisfaction with the proposed idea (Perevozchikova, Sokolova, Gavrilovskaya, & Benin, 2023). This was done to gather initial impressions and understand why this tool is effective in developing the cognitive learning of the students in that class.

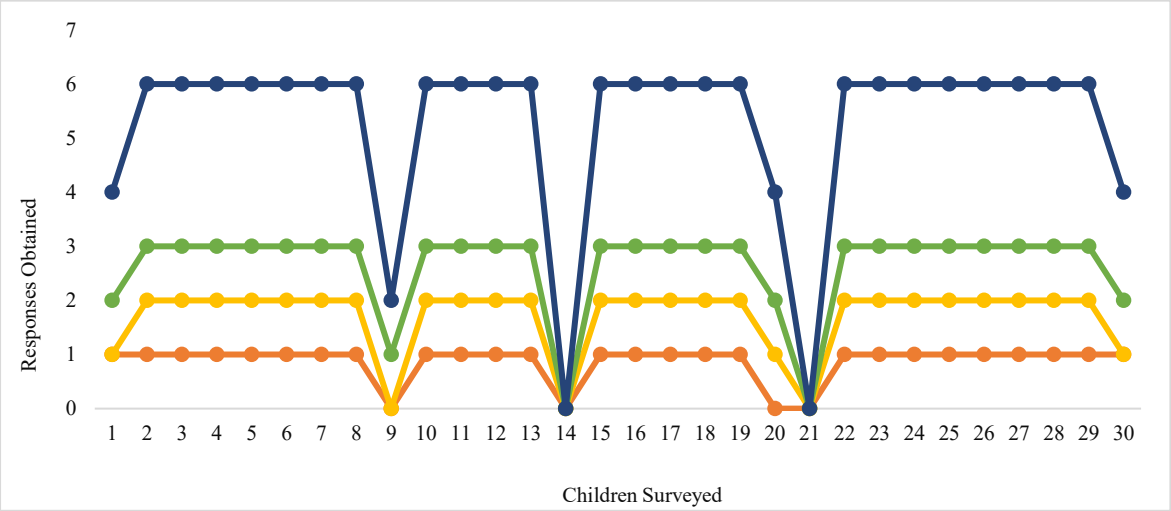

Figure 8. Survey conducted during the execution of the game

The developed survey was subjected to Cronbach's Alpha (Zakariya, 2022) to determine the reliability percentage, which resulted in 82%, allowing us to work with the data.
In this survey, children were asked if they were satisfied with the game. The responses showed that 86% of the students understood how to use the platform and access it. The second question addressed their enjoyment of the platform and whether the information was being effectively received. 83% responded that they liked the game and the way they could interact with classmates by simulating a competition. In the third and final question, students were asked about the learning outcomes of the game and whether they had fully grasped the concepts presented. Only 6% (2 students) did not understand the concepts developed within the game.
Once the game was applied to test interaction with the children and the developed concepts, a final test was administered to assess the information captured, the concepts understood, and the ideas recognized.

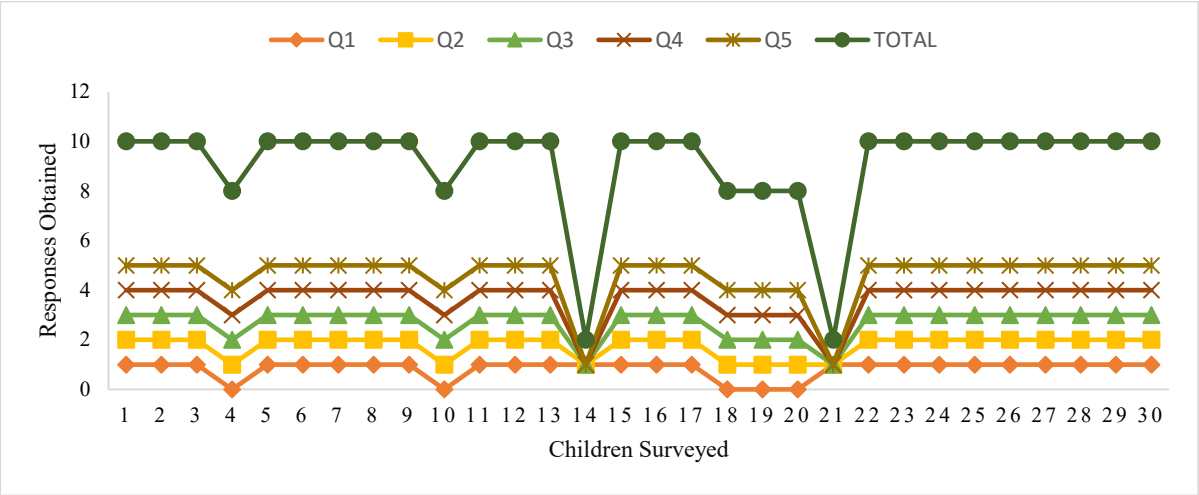

Figure 9. Results obtained from the final questionnaire

These results were obtained by administering the survey after the interaction with the students. The survey was conducted to determine which financial concepts were favorably received by the students. The survey was evaluated for reliability using the previously mentioned Cronbach's Alpha (Toro, Peña - Sarmiento, Avedaño Prieto, Mejía Vélez, & Bernal Torres, 2021, and this time, the reliability percentage was 79%, which allowed us to use the obtained results.

In four questions, the four levels of the game were addressed in detail, covering the concepts of saving, spending, investing, and budgeting. The results are encouraging, as they show that 93% of the students understood the concepts and know their applications. Question five related to how the learned concepts were implemented, specifically the change from the beginning to the end of the activity. The change was favorable, indicating that the message was received and applied quickly.

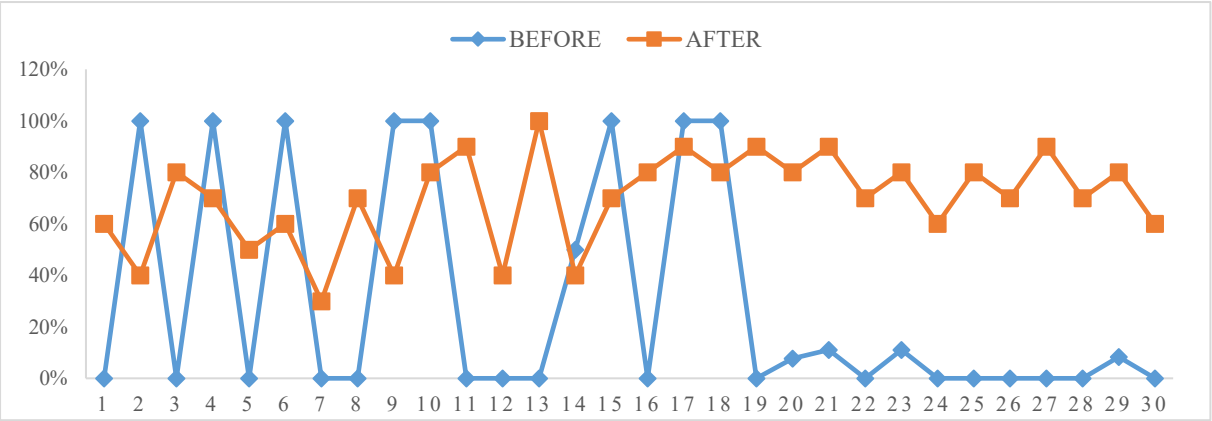

Figure 10. Comparison of savings of surveyed students

The results obtained from the first and third surveys reflect that the information provided to the students was assimilated and understood. The data collected shows that the 30 surveyed students made a change in their economic culture. The term "saving" was evaluated from the beginning, with questions about whether they saved money or not. Most responses were affirmative, but students admitted not understanding the meaning of saving or its purpose (Liu & Lin, 2021). 53% of the students reported that their savings were nonexistent, as they spent their money on food or popular games. However, after averaging the data, it was evident that the average savings before using the game was 30%. This figure reflects the poor financial education in the country (Superintendencia de Banca, Seguros y AFP (SBS), 2022).

After completing the learning experience, the same questions were asked, showing encouraging results. The savings rate increased to 70%, a significant 40% increase in a short period, demonstrating that children are capable of understanding financial concepts and that a financial culture can be developed from a young age.

The obtained data is positive, as comparisons with other financial education projects through gamification (Figol, Faichuk, Pobidash, Trishchuk, & Teremko, 2021) reveal that educational games were not sufficiently engaging for young children because they did not provide relevant information and could not be applied long-term (Garza Puentes, Castañeda, & Rodríguez, 2022). Similarly, another gamification technique applied to financial learning in China (Ying, 2016), which involved creating an electronic platform for a group of university students to measure their knowledge, demonstrated that appropriately applied technology (Hoyos-Morales, 2019), increased the percentage of students who understood key financial management terms. From the start to the end of that study, the variation in satisfaction among evaluators was 50%. Upon completion of the research, consulted teachers (González, Toledo, & Muñoz , 2016) recognized that the tool helped them measure students' levels and determine the percentage of learning within the class.

These results indicate that gamification is a tool that helps children develop cognitive skills (Vankus, 2005) that are often not developed in schools due to their strict educational models (Almache Granada , Mora Aristega, Garcia Leon , & Cifuentes Rojas , 2020). This is an alternative that demonstrates with data and precedents that a well-structured approach executed within a set timeframe can yield optimal results for effective financial learning in children, encouraging savings from the age of 10 and fostering the development of a financial culture.

CONCLUSION

The gamification tool used is both didactic and effective compared to traditional learning samples (Rui, Moreira , & Zurlo, 2022).. The digital game provides students with an easier way to learn new concepts, in this case, financial literacy. Additionally, it fosters children's creativity by allowing direct interaction, and the collected data significantly enhances financial learning for children aged 10 to 12 years. It has been demonstrated that children can assimilate the information provided through the platform, as one of the final questionnaire questions was: "Is the amount of money you save now greater than the amount you saved before? Do you think you can create a budget?" The results showed that responses to both questions were affirmative for more than 70% of the participants. The advantages of gamification in financial learning are evident as it also significantly benefits schools by implementing a system that helps students become knowledgeable about financial concepts they can apply from a young age.

REFERENCES

A. Bucchiarone, T. Martorella y D. Colombo , «PolyGloT: A Personalized and Gamified eTutoring System,» *Scopus,* p. 6, 27 Octubre 2022.

Z. Xiangping, «Analysis on the Application of Cause Intelligence Financial,» *IOPSCIENCE,* p. 8, 2021.

D. Baldo de Faveri, M. Kroetz y I. Valentim, «Educação financeira para crianças,» *ResearchGate,* vol. 14, nº 7, p. 11, 2023.

M. Herrero Vázquez, A. Torralba Burrial y M. E. Del Moral Pérez, «Revisión de investigaciones sobre el uso de juegos digitales en la enseñanza de las ciencias de la vida en Primaria y Secundaria.,» *Repositorio Institucional de la Universidad de Oviedo,* p. 18, 2020.

A. Naresh Bhatt y A. Chakrabarti, «Gamification of design thinking: a way to enhance effectiveness of learning,» *Cambridge University Press,* p. 20, 26 Junio 2022.

D. Hurtado Cuenca, L. Tacuri Peña y Y. Merchan Valarezo, «Evaluación de la educación financiera en los niños de las escuelas municipales del GAD - Loja,» *Redalyc,* vol. 5, nº 2, p. 20, 2 Abril 2021.

Superintendencia de Banca, Seguros y AFP (SBS), «Superintendencia de Banca, Seguros y AFP,» 2015. [En línea]. Available: https://www.sbs.gob.pe/Portals/4/jer/PUB-NOTA-POLITUCA/Notas%20SBS_Nota%20N%C2%B0%207_Nota%20de%20pol%C3%ADtica%20N_7_30.06.21.pdf.

O. A. Aleksandrova, N. V. Alikperova, K. V. Vinogradova y Y. S. Nenakhova, «Conceptual Approaches to Creating the Preconditions for Effective,» *Scopus,* vol. 12, nº 4, 2020.

Banco Central de Reserva del Perú, «Banco Central de Reserva del Perú,» Mayo 2022. [En línea]. Available: https://www.bcrp.gob.pe/docs/Publicaciones/Reporte-Estabilidad-Financiera/2022/mayo/ref-mayo-2022-recuadro-3.pdf.

B. Reeves y L. Read, Total Engagement: How Games and Virtual Worlds Are Changing the Way People Work and Businesses Compete., Boston: Harvard Business Press, 2009.

I. J. Pérez López y C. Navarro Mateos, «Gamificación: lo que es no es siempre lo que ves,» *ResearchGate,* p. 22, 1 Julio 2022.

T. Hainey, T. Connolly, E. Boyle, A. Azadegan, A. Wilson, A. Razak y G. Gray, «A systematic literature review to identify empirical evidence on the use of games-based learning in primary education for knowledge acquisition and content understanding,» *ProQuest,* vol. 1, p. 10, 2014.

y. Ying, «Construction of electronic examination and education platform for financial management,» *SCOPUS,* p. 6, 11 Setiembre 2016.

J. Tsarapkina, O. Vaganova, A. Lapshova, M. Koldina y I. Sedov, «Gamification in modern education,» *Web Of Science,* p. 12, 19 Octubre 2021.

C. Merino Soto, «Internal Consistency of Eysenck Personality Questionnaire - Revised: When,» *Web of Science,* p. 14, 18 Marzo 2018.

J. Novak , «Pouzdanost mjerenja u psihologiji: Razvoj metode, zaluđenost Cronbachovim alfa koeficijentom i preporuke za ispravnu procjenu pouzdanosti,» *Web of Science,* p. 31, 2020.

G. Alkhadim, «Cronbach's Alpha and Semantic Between Items: A Proposed Correction and Tests of Significance,» *Web of Science,* p. 6, 10 Febrero 2022.

I. J. Pérez-López y C. Navarro-Mateos, «Gamificar no es jugar, pero jugar ayuda a gamificar,» *ReseachGate,* p. 7, Julio 2023.

J. P. Garza Puentes, J. A. Castañeda y L. M. Rodríguez, «Los juegos de mesa como estrategia pedagógica. Un estudio de caso para la enseñanza de las finanzas y la contabilidad para niños,» *ReseachGate,* p. 11, Abril 2022.

M. Magadán Díaz y J. Rivas-García, «Gamificación del aula en la enseñanza superior online: el uso de Kahoot,» *ResearchGate,* p. 16, 31 Enero 2022.

M. Perevozchikova, A. Sokolova, N. Gavrilovskaya y D. Benin, «Research of the Possibilities of Interactive Simulators in Intercultural Communication for the Formation of Students' Algorithmic Thinking,» *European Journal of Contemporary Education,* p. 15, 2023.

Y. Zakariya, «Cronbach's alpha in mathematics education research: Its appropriateness, overuse, and alternatives in estimating scale reliabi,» *Scopus,* p. 6, 22 Diciembre 2022.

R. Toro, M. Peña - Sarmiento, B. L. Avedaño Prieto, S. Mejía Vélez y A. Bernal Torres, «Empirical Analysis of Cronbach's Alpha Coefficient as a Function of Question Response Options, Sample Size and Outliers,» *Web of Science,* p. 15, 2021.

H.-C. Liu y J.-S. Lin, «Impact of Internet Integrated Financial Education on Students' Financial Awareness and Financial Behavior,» *ResearchGate,* p. 5, 28 Septiembre 2021.

Superintendencia de Banca, Seguros y AFP (SBS), «Superintendencia de Banca, Seguros y AFP (SBS),» 2022. [En línea]. Available: https://www.sbs.gob.pe/Portals/4/jer/CIFRAS-ENCUESTA/2022/Brochure_ENCUESTA_CAPACIDADES%20FINANACIERAS%202022_vr.pdf.

N. Figol, T. Faichuk, I. Pobidash, O. Trishchuk y V. Teremko, «Application fields of gamification,» *Web Of Science,* p. 8, Enero 2021.

J. I. Hoyos-Morales, «Enseñanza de habilidades argumentativas básicas a través de un juego serio online,» *Revista Iberoamericana de Argumentación,* p. 30, 30 Junio 2019.

C. González, P. Toledo y V. Muñoz , «Enhancing the Engagement of Intelligent Tutorial Systems through Personalization of Gamification,» *ResearchGate,* p. 14, 2016.

P. Vankus, «History and present of didactical games as a method of mathematics' teaching,» *ResearchGate,* p. 17, Enero 2005.

G. K. Almache Granada , J. E. Mora Aristega, E. P. Garcia Leon y M. T. Cifuentes Rojas , «Gamifying formative assessment to improve speaking accuracy and motivation in EFL learners,» *Dialnet,* p. 16, 28 Dieciembre 2020.

O. Pedreira, F. García, M. Piattini, A. Cortiñas y A. Cerdeira-Penas, «An Architecture for Software Engineering Gamification,» *Web of Science,* vol. 25, nº 6, p. 22, 2020.

P. Rui, A. C. Moreira y F. Zurlo, «Gamification in innovation teams,» *Web of Science,* p. 13, 1 Setiembre 2022.

. M. Fathian, H. Sharifi y E. Nasirzadeh, «Conceptualizing the Role of Gamification in Contemporary Enterprises,» *Web of Science,* p. 17, 18 Diciembre 2020.

S. Khrapov, L. Baeva, A. Grigorev y D. Bibarsov, «Virtual Gamification and Problems of Students' Social Interaction,» *Web of Science,* p. 12, 20 Octubre 2022.

N. Malaniuk, D. Hubarieva, T. Sviatenko, I. Gogunskaya y I. Parfanovich, «Means of gamification of learning during martial law,» *Web of Science,* vol. 12, p. 12, 27 Junio 2023.