

Promoting Healthy Eating Through a Board Games

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Abstract. Introduction: *The increasing rates of childhood obesity in Brazil, associated with the country's nutritional transition and the high consumption of ultra-processed foods, emphasize the need for effective pedagogical strategies that foster Food and Nutrition Education (FNE) in school settings. In this context, educational games represent valuable tools for promoting learning through engaging and interactive experiences. Objective:* *This study presents the design, development, and implementation of Dieta em Jogo ("Diet in Play"), a card-based board game inspired by blackjack mechanics, developed as a didactic resource to encourage healthy eating habits among students and support nutritional education in schools. Methodology:* *The research adopts an applied approach with qualitative methods and field observation. The game development process followed stages based on established frameworks for educational and health-related games. Data collection involved both internal and external testing phases with diverse audiences to gather feedback and refine the game. Internal evaluations were conducted with nutrition specialists to ensure scientific accuracy and prevent the dissemination of misconceptions. External testing, carried out with students and at public events, contributed to validating the game's mechanics and content, producing positive feedback regarding its clarity, interactivity, and educational relevance. Results:* *The results indicate that Dieta em Jogo is an effective pedagogical tool for supporting the understanding of key nutritional concepts, including the functions of macronutrients and the importance of maintaining a balanced diet. Keywords* Food and nutrition education, Board games, Healthy eating.

1. Introduction

According to data from the Food and Nutrition Surveillance System, nearly 30% of Brazilian children aged 5 to 10 are overweight, reflecting a concerning trend in the growth of childhood obesity in the country [Brazil 2021].

This scenario is a consequence of the so-called nutritional transition, a phenomenon characterized by the replacement of fresh foods with ultra-processed products, which are rich in sugars, fats, and artificial additives [Popkin 2017]. Changes in eating habits, associated with sedentary lifestyles, have contributed to the increase in non-communicable chronic diseases (NCDs), such as diabetes and hypertension.

From a technical perspective, healthy eating is defined as a diet that meets an individual's nutritional needs in terms of quantity, quality, balance, and adequacy. However, for children to develop balanced eating habits, it is essential that they understand from an early age the importance of a varied and balanced diet appropriate to their stage of development. Food and Nutrition Education (FNE), established in public policies such as the National School Feeding Program (PNAE), seeks to promote this understanding through pedagogical actions that go beyond the mere transmission of information.

In this context, the playful nature of games enhances motivation, engagement, and meaningful learning, while enabling the discussion of complex topics in an accessible and interactive way [Kishimoto 1998][Amorim 2021].

Given this context, the following guiding question emerges: is it possible to develop a board game capable of promoting the learning of healthy eating habits in a playful and engaging way for school-age individuals? This question guides the proposal presented in this article, which aims to integrate nutritional knowledge with playful teaching strategies through the development of a card-based board game inspired by the dynamics of blackjack.

The general objective of this research is to present the development and implementation process of the game *Dieta em Jogo*, exploring its potential as a pedagogical tool for nutritional education. This article is organized as follows: after this introduction, the theoretical framework supporting the proposal is presented, followed by the methodological description of the game's development and implementation, the analysis of the results obtained from testing, and finally, the concluding remarks with reflections on the observed impacts and possible future developments.

2. Theoretical basis

Global nutritional transition, according to [Popkin 2017], is characterized by the replacement of traditional diets (based on fresh foods) with industrialized dietary patterns. In dialogue with this scenario, [Monteiro et al. 2019] point out that this transition is directly linked to the increase in obesity and metabolic diseases. This shift requires special attention to child and adolescent health, demanding policies that promote Food and Nutrition Education (FNE) in formal educational settings, such as schools.

In Brazil, 29.76% of children aged 5 to 10 and 31.85% of adolescents are overweight, with severe obesity rates reaching 5.68% and 2.87% in these age groups, respectively [Brazil 2021]. [Monteiro et al. 2019] developed the NOVA Classification, which categorizes foods according to their degree of processing, highlighting ultra-processed products that directly impact health due to their high levels of sugars, fats, and chemical additives. These data reinforce [Popkin 2017] concerns and confirm the early introduction of industrialized products into the diets of children and adolescents. From this perspective, there is a need to deepen the understanding of basic nutrition concepts, such as the role of macronutrients and the interpretation of nutritional labels found on commercially available foods.

[Xu et al. 2021] developed a framework consisting of an integrated education model, from which we emphasize two key pillars: “nutrition and health education” and the “school food environment.” The first stresses the inclusion of balanced diet content within

the school curriculum, while the second aims to create an environment that encourages healthy choices. These concepts are aligned with the guidelines followed by the National School Feeding Program (PNAE), a Brazilian government initiative designed to ensure free meals for all students in public basic education. To achieve this, the program follows the recommendations outlined in the Dietary Guidelines for the Brazilian Population [Brazil 2014], promoting healthy eating through fresh foods in schools and, consequently, supporting local agriculture [Resolution No. 06/2020].

Based on this context, it becomes possible to explore fundamental nutrition concepts, guiding students to better understand food composition, the role of calories in energy balance, and the critical reading of nutritional labels, thereby enabling them to comprehend the impacts of excessive consumption of industrialized products. However, as essential as these topics are, mere theoretical exposition is not sufficient to ensure knowledge assimilation. [Amorim 2021] demonstrates that active methodologies, such as educational games, enhance learning by making abstract concepts more accessible through playful elements and interaction.

Currently, the use of games as a didactic resource for complementing and reinforcing the learning of specific content has become increasingly popular, particularly because the technological era facilitates the absorption of content presented in a more playful format and connected to students' everyday leisure activities. "We also know that games are powerful tools to enhance learning in various areas of knowledge" [Fardo 2013, p.1].

The strategies and mechanics used in games, whether digital or analog, enable dynamic learning, making the educational process more engaging and effective. [Kishimoto 1998] argues that games can be used in educational contexts as long as their playful nature is preserved. The act of playing should not be suppressed by pedagogical intentionality but rather integrated with it. In this way, the playful and the educational dimensions must work together to promote effective learning that goes beyond mere entertainment.

According to Yozo [Torres et al. 2003], games are an effective means of communication among individuals and a powerful tool for teaching and learning, also providing immediate emotional satisfaction to participants, which contributes positively to the process. In discussing stages of development within Jean Piaget's theory, [Cavicchia 2010] highlights interaction as one of the main allies in intellectual and socio-emotional development. In other words, whether child, adolescent, or adult, knowledge is consolidated through actions that deepen learning across various aspects of personal development, including the formation of healthy eating habits.

3. Methodology

This study is characterized as applied development research, with a qualitative approach and experimental field observation. During the data collection stage, elements and phenomena were considered and recorded in order to understand the applicability and results achieved by the proposed development, as stated by Marconi and Lakatos:

"Field research is used with the objective of obtaining information and/or knowledge about a problem for which an answer is sought, or about a hypothesis to be

tested, or with the purpose of discovering new phenomena or relationships among them. It consists of observing facts and phenomena as they occur spontaneously, collecting data related to them, and recording variables presumed to be relevant for their analysis.” [Marconi e Lakatos 2017, p.202–203]

We developed a proposal for the design and testing of *Dieta em Jogo* (see Figure 1), inspired by the tutorial proposed by [Carretta 2010] for board game development, which outlines a process consisting of the following steps: “playing games to think about games,” “manuscript prototyping,” “playtesting,” and “final prototyping.” In addition, other inspiring methodologies included studies on the development of health-related games by [Nery Filho et al. 2024] and educational games by [Antunes et al. 2018], which follow a structured process divided into the following stages: “preliminary studies,” “analysis of similar games,” “prototyping,” and “development and testing.”

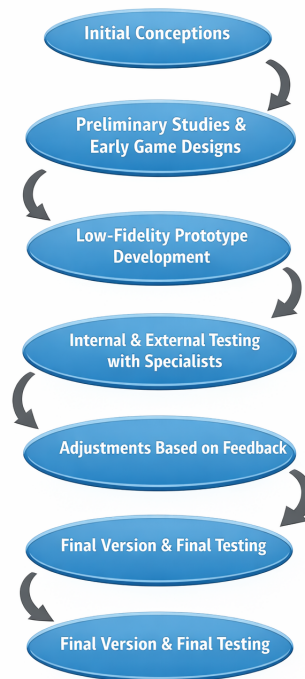


Figura 1. Flowchart of the game development process. Source: Authors'own work.

A framework inspired by the cited studies was developed to improve the monitoring and organization of the work. The process was divided into six major phases: initial conceptions, preliminary studies and analysis of similar games, prototype development, testing, and adjustments leading to the final version (see Fig. 1).

3.1. Initial conceptions

The first stage of development involved considering different perspectives regarding the object to be developed, including its genre, focus area, materials, and mechanics. From the diversity of ideas, we arrived at the game's basic concept: the development of a game

focused on learning Food and Nutrition Education through mechanics similar to the card game blackjack, in which players attempt to reach a caloric target without exceeding it.

3.2. Preliminary studies and similar games

The pre-production stage of *Dieta em Jogo* began with an in-depth exploration of the fields of health and educational games through discussions and research. The main objective was to understand concepts related to diet, balanced nutrition, and macronutrients — such as proteins, fats, and fibers — as well as to reflect on how to adapt this content to the game format and to study games similar to the proposed design.

Based on the methodology of using educational games in classrooms to facilitate learning, we identified initiatives that address topics such as nutrition and healthy eating. Two relevant examples are the games *Sobrevivência* [Vasconcelos e Poian 2020] and *Na Trilha dos Nutrientes* [Santos e Oliveira 2018], which use playful approaches to teach concepts related to nutrition and energy metabolism.

Sobrevivência is an investigative and cooperative board game developed by Thyago Santos de Vasconcelos and Andrea Thompson Da Poian. The game was created to teach concepts of nutrition and energy metabolism to high school students, focusing on biomolecules such as carbohydrates, proteins, and lipids, as well as the interpretation of nutritional labels. Its implementation took place at Colégio de Aplicação de Macaé, where students solved challenges related to the disappearance of food items by collecting clues and answering questions about nutrition. The results showed a significant increase in students' understanding of energy sources and the critical reading of nutritional information, highlighting the effectiveness of the playful approach [Vasconcelos e Poian 2020].

Developed by researchers from Fiocruz and UNIFOA, the game *Na Trilha dos Nutrientes* was designed to help 8th-grade elementary school students understand nutritional profiles and individual caloric needs. During the game, students assembled meals based on a food table presenting the nutritional values of each item, balancing nutrients such as proteins, fats, and fibers. This process helped them understand, in practice, the energy requirements of different profiles and the importance of adapting diets to individual characteristics. The activity promoted improved understanding of the content and greater awareness of healthy eating habits, reinforcing the value of educational games as tools that facilitate the learning of complex topics in a meaningful way and in close connection with students' reality [Santos e Oliveira 2018].

3.3. Low-level prototype development

During the prototyping phase, tasks were distributed among the Research Group members, such as: developing the rules, producing the materials (pieces, cards, and board), and designing the visual artwork. We prioritized the use of recyclable materials, such as PET bottle caps and office paper, aiming to make it possible to play the game without requiring robust materials. Weekly meetings were held, focusing on task completion and reflection on the game's development.

3.4. Internal and external testing with experts.

After completing the initial version, we conducted tests with a nutrition specialist, as well as internal group testing and external public testing during FERBON, a local event held

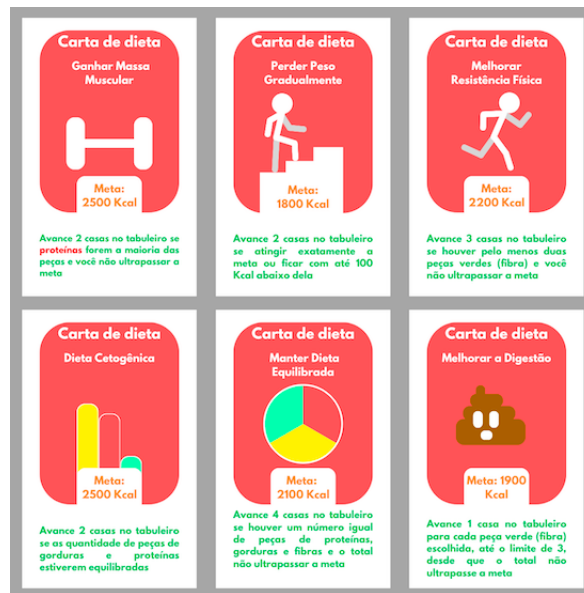


Figura 2. Examples of some mission cards.

in the city of Senhor do Bonfim-BA.

3.5. Adjustments based on feedback.

Based on the observations obtained at each testing stage, continuous adjustments were made to the game, covering aspects such as the wording of the rules and visual and conceptual elements, with the aim of improving gameplay and making the next round of evaluation more efficient and aligned with the project's objectives.

3.6. Final version and final test.

Based on these tests, several adjustments were made for the final version of the game, including the 3D printing of the pieces, modifications to the cards (see Fig. 2) and board, improving gameplay, and removing certain errors. After the project was completed, new tests were conducted with students from the IFBAIANO programs in order to obtain feedback on the newly implemented changes.

4. Results and discussions

During the game development process, several tests were conducted within the GEJIF Study Group. The group is divided into different units, and testing took place both within the game development unit and in other units. Conducting tests with different units made it possible to explore diverse perspectives on the game, since developers, being directly involved in the project, may present bias in their evaluations. Additionally, these tests helped adjust the game's pacing and clarity. However, the importance of external testing is not diminished, especially considering that group members possess broader knowledge about games and development.

The initial tests were essential for defining the game's design, resulting in adjustments to both the pacing and dynamism of gameplay. Understanding how the game's features manifested during matches enabled the removal of non-essential

elements. Throughout development, several ideas were tested, modified, or maintained based on the results obtained from these preliminary tests. Whenever a significant change was implemented — such as the addition of new effects or modifications to the number of cards or players — new tests were conducted with other units of the GEJIF Study Group, ensuring a more comprehensive evaluation of the game's new features and their impact on gameplay.

At a more advanced stage of development, with the proposal, objectives, artwork, mechanics, and rulebook well structured, the game was tested with an external audience during FERBON, held in Senhor do Bonfim - BA on November 24, 2024 (see Figure 3). During the event, visitors had the opportunity to try the initial versions of the game and provide feedback. The main difficulty observed in this testing phase was the complexity of the rules, which proved to be excessively verbose. However, participants showed strong engagement with both the gameplay and the game's overall proposal.



Figure 3. External testing at FERBON Event.

The testing session lasted approximately three hours. Based on the observations collected, changes were made to the rulebook, making the writing clearer and incorporating more images to facilitate understanding. In addition, new game modes were developed, allowing different numbers of players and expanding the flexibility of the experience.

On December 2, 2024, an interview was conducted with the nutritionist Bruno Leite, lasting approximately two hours. The main objective of the interview was to test the game and identify possible technical inconsistencies related to nutrition, since the game includes diet cards that may be interpreted by players as guidelines to be followed.

Thus, a detailed analysis of each card was essential, considering the risk of disseminating misinformation. It is important to emphasize that the game adopts a certain degree of creative license, allowing the use of playful elements to make it more engaging. However, this approach should not compromise the accuracy of the information conveyed.

During the interview, the specialist suggested that the recommended age range for the game should be 10 years and older, corresponding to the 6th grade of elementary school. In addition, the specialist proposed adjustments to the terminology of certain terms to facilitate understanding by the target audience, as well as modifications to specific cards so that they would more accurately reflect nutritional reality.

Given the educational nature of the game and its direct relation to the field of Nutrition, the specialist recommended that the game be validated with students from technical programs in food studies and undergraduate programs in Nutrition. This step is essential to ensure the accuracy of the information presented and the adequacy of the content within the context of the game.

At IFBAIANO, Campus Senhor do Bonfim, on February 17, 2025, two tests were conducted: the first with students from the Subsequent Technical Course in Food Technology, with a total of seven participants, supervised by their teacher. The activity began with an introduction to the rules, followed by a practical demonstration of the game's stages. Initially, there was some difficulty with the dynamics of calorie counting, especially in reaching the specific goals indicated on their diet cards, which generated some frustration. However, over time, the assimilation of the rules became natural and the game proceeded without setbacks.



Figura 4. Test with students from the Informatic Course.

The second test group consisted of undergraduate students in the Teaching Degree program in Informatics, also with seven students from the course Electronic Games in Education. In both tests, at the end of the sessions, players highlighted two main points: the initial difficulty with the game mechanics and the inclusion of pieces with lower calorie values, which would facilitate the achievement of objectives. Despite the challenges, the game was well received by the participants, who reported that they would play again, especially after mastering the rules through the experience.

5. Final considerations

The research presented here demonstrated the potential of educational games as an effective tool for promoting healthy eating habits among the general public. Starting from the concerning reality of increasing obesity rates in Brazil and worldwide, the study sought a playful and engaging alternative to introduce concepts of nutrition in an accessible and meaningful way. The development of *Dieta em Jogo* thus emerges as a response to an urgent demand for methodologies that combine learning and enjoyment, promoting real changes in people's eating behavior.

Throughout the creation process, well-established methodologies in the field of game development for health and education were adopted, combined with the practice of games already successfully used in other educational initiatives. The choice of a mechanic inspired by the blackjack game, adapted to the nutritional context, proved effective by allowing players to assimilate concepts such as caloric balance and types of food while enjoying the proposed challenges. The testing phase, conducted with diverse audiences, was essential for refining the language, design, and rules, ensuring greater clarity and suitability for the target audience.

The results observed during testing show that, despite initial obstacles—such as the complexity of the rules and difficulties in calorie counting—players demonstrated progressive learning and increasing interest in the content addressed. The suggestions received from both students and nutrition specialists were fundamental in improving the proposal, making the game more accessible, accurate, and educational. The positive reception by participants reinforces the importance of playfulness as a mediator in the knowledge construction process.

Despite the general limitations of this research and within a specific context, it can be concluded that *Dieta em Jogo* represents a relevant contribution to the field of Food and Nutrition Education, particularly in the school environment. In addition to meeting the guidelines of the National Common Curricular Base (BNCC) and current legislation, the initiative provides an interactive experience that can transform how young and adult students understand and relate to food. For future actions, it is recommended to expand the project to other educational levels and to continuously validate the content with health professionals, ensuring that the educational character of the game is preserved and expanded across different contexts.

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Referências

Amorim, M. C. (2021). Educação alimentar & nutricional – o jogo como ferramenta motivadora de hábitos alimentares saudáveis para estudantes dos anos iniciais do ensino fundamental. Dissertação (Mestrado em Ensino das Ciências na Educação Básica) – Universidade do Grande Rio (UNIGRANRIO), Duque de Caxias.

- Antunes, J., De Queiroz, Z. F., Santos, R. D., e I. B., Lima, J. N. (2018). Ciclo criativo de jogos colaborativos: Um método para criação de jogos educativos. *Holos. D.O.I*: <https://doi.org/10.15628/holos.2018.3298>.
- Brazil (2014). Ministry of health, secretariat of primary health care. guia alimentar para a população brasileira. 2nd ed., Brasília, DF. 156 p. Published in 2014 . Accessed in feb. 2026. Available at https://bvsms.saude.gov.br/bvs/publicacoes/guia_alimentar_populacao_brasileira_2ed.pdf.
- Brazil (2021). Brazilian ministry of health - obesidade infantil afeta 3,1 milhões de crianças menores de 10 anos no brasil. Published in jun. 2021. Accessed in feb. 2026. Available at <https://www.gov.br/saude/pt-br/assuntos/noticias/2021/junho/obesidade-infantil-afeta-3-1-milhoes-de-criancas-menores-de-10-anos-no-brasil>.
- Carretta, M. L. (2010). Tutorial como fazer jogos de tabuleiro. *Manual Prático, Proceedings of SBGames*, 2018.
- Cavicchia, D. d. C. (2010). O desenvolvimento da criança nos primeiros anos de vida. *Caderno de Formação: Formação de Professores: Educação Infantil: princípios e fundamentos*.
- Fardo, M. L. (2013). A gamificação aplicada em ambientes de aprendizagem. *Renote. D.O.I*:<https://doi.org/10.22456/1679-1916.41629>.
- Kishimoto, T. Z. (1998). *O Jogo e a Educação Infantil*. Pioneira, 2º ed. são paulo edition.
- Marconi, M. d. A. e Lakatos, E. M. (2017). *Fundamentos de metodologia científica*. São Paulo, 2º ed. são paulo edition.
- Monteiro, C. A., Cannon, G., Moubarac, J.-C., Levy, R. B., Louzada, M. L. C., e Jaime, P. C. (2019). Ultra-processed foods: What they are and how to identify them. *Public Health Nutrition. D.O.I*:<https://doi.org/10.1017/S1368980018003762>.
- Nery Filho, J., de Paulo, D., e Oliveira, Y. (2024). Dalton's game: desenvolvimento de um jogo acessível para pessoas com daltonismo, um processo de envolvimento dos especialistas e sujeitos. In *Anais do XXIII Simpósio Brasileiro de Jogos e Entretenimento Digital*, pages 1596–1607, Porto Alegre, RS, Brasil. SBC.
- Popkin, B. M. (2017). Relationship between shifts in food system dynamics and acceleration of the global nutrition transition. *Nutrition Reviews*, 75. *D.O.I*:<https://doi.org/10.1093/nutrit/nuw064>.
- Santos, G. S. e Oliveira, M. F. A. (2018). O jogo como recurso didático para o ensino de nutrição. *Trilha dos nutrientes. Ensino, Saúde e Ambiente. D.O.I*:<https://doi.org/10.22409/resa2018.v11i3.a21508>.
- Torres, H., Hortale, V. A., e Schall, V. (2003). A experiência de jogos em grupos operativos na educação em saúde para diabéticos. *Cadernos de Saúde Pública. D.O.I*:<https://doi.org/10.1590/S0102-311X2003000400026>.
- Vasconcelos, T. S. e Poian, A. T. (2020). O ensino de nutrição e metabolismo energético a partir de um jogo de tabuleiro denominado sobrevivência versão 1.0. *Revista de Ensino de Biologia da SBEnBio – REnBio. D.O.I*:<https://doi.org/10.46667/renbio.v13i1.284>.

Xu, Y. Y., Sawadogo-Lewis, T., King, S. E., M. A., e Roberton, T. (2021). Integrating nutrition into the education sector in low- and middle-income countries: A framework for a win-win collaboration. *Maternal & Child Nutrition*, 17, e13156. D.O.I: <https://doi.org/10.1111/mcn.13156>.