A playful game to teach Geography: the rivers of the Amazon[1]

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ABSTRACT

This article discusses the use of learning games as a pedagogical tool for teaching Geography, focusing on the theme of the rivers of the Amazon in activities conducted by teachers in training linked to the Institutional Program for Teaching Initiation Scholarships (PIBID). The objectives outlined were to discuss the use of games in the teaching and learning process, highlighting their importance in the context of Geography teaching; to develop a game that dealt with the main rivers of the Amazon; and to analyze the feasibility of using the game built in Geography classes aimed at elementary school students. The methodology adopted emphasized qualitative aspects, complemented by quantitative data. The results obtained indicate the feasibility of using the game "Super-Trunfo dos Rios da Amazônia" in the context of the primary school classroom, especially due to its ability to engage students in the activity and the curiosity aroused about the topic.

KEYWORDS: Teaching Geography. Hydrography of the Amazon. Pedagogical games. PIBID.

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Um jogo lúdico para o Ensino de Geografia: os rios da Amazônia

RESUMO

Este artigo aborda o uso de jogos de aprendizagem como ferramenta pedagógica para o ensino de Geografia, focalizando a temática dos rios da Amazônia em atividades conduzidas por professores em formação vinculados ao Programa Institucional de Bolsas de Iniciação Docência (PIBID). Os objetivos delineados foram discutir a utilização de jogos no processo de ensino e aprendizagem, destacando sua importância no contexto do ensino de Geografia; desenvolver um jogo que abordasse os principais rios da Amazônia; e analisar a viabilidade do uso do jogo construído em aulas de Geografia destinadas a alunos do Ensino Fundamental II. A metodologia adotada enfatizou aspectos qualitativos, complementados por dados quantitativos. Os resultados obtidos indicam a viabilidade do emprego do jogo "Super-Trunfo dos Rios da Amazônia" no contexto da sala de aula da educação básica, especialmente pela capacidade de engajar os estudantes na atividade e da curiosidade despertada para o tema focalizado.

PALAVRAS-CHAVE: Ensino de Geografia. Hidrografia da Amazônia. Jogos Pedagógicos. PIBID.

Un juego lúdico para enseñar Geografía: los ríos de la Amazonía

RESUMEN

Este artículo aborda el uso de juegos de aprendizaje como herramienta pedagógica para la enseñanza de Geografía, centrándose en la temática de los ríos de la Amazonía en actividades realizadas por profesores en formación vinculados al Programa Institucional de Becas de Iniciación a la Docencia (PIBID). Los objetivos delineados fueron discutir la utilización de juegos en el proceso de enseñanza y aprendizaje, destacando su importancia en el contexto de la enseñanza de Geografía; desarrollar un juego que abordara los principales ríos de la Amazonía; y analizar la viabilidad del uso del juego construido en clases de Geografía destinadas a alumnos de la Educación Fundamental II. La metodología adoptada enfatizó aspectos cualitativos, complementados con datos cuantitativos.

Los resultados indican la viabilidad del empleo del juego "Super-Trunfo dos Rios da Amazônia" en el contexto del aula de educación básica, especialmente por su capacidad para involucrar a los estudiantes en la actividad y despertar la curiosidad sobre el tema enfocado.

PALABRAS CHAVE: Enseñanza de Geografía. Hidrografía de la Amazonía. Juegos Pedagógicos.

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Introduction

The Amazon River, the largest river in the world in terms of length and volume of water, together with the huge number of secondary rivers in its watershed, contribute to a significant amount of water transport. The main tributaries of the Amazon River are: Javari, Jari, Purus, Madeira, Içá, Japurá, Negro, Tapajós, Xingu and Trombetas, but the literature indicates that there are more than 1,100 tributaries. In the Amazon, rivers play a fundamental role in conditioning, dictating rhythm and regulating life in the region. Along their banks, there are several cities that use these rivers as a source of food, a means of transportation for people and goods, a leisure area and other relevant activities.

In the classroom, especially in Geography, rivers, their characteristics and all the activities related to them are discussed. However, during a pedagogical experience in an 8th grade class, when approaching this subject, most of the students revealed that they only knew two rivers in the Amazon: the Amazon River and the Negro River. Given the limited familiarity with the diversity of rivers in the region, the idea arose to develop a teaching strategy that would arouse the students' interest and curiosity about this topic.

Considering that the geography teacher, committed to a meaningful geography education that aims to train students to analyze the space in which they live, recognizes in playfulness an important methodological

support to mediate the relationship between the student and the geographical space. In the pedagogical experience described here, the choice was made to use an educational game that would contribute to the approach to Amazonian hydrography.

As Pinheiro et al. (2013, p.29) emphasize, the game can be used before the content is presented, helping to familiarize students with its procedural dimension. This is particularly advisable in elementary school because, as far as possible, it is advisable to start learning from concrete experiences and then develop abstraction processes. Furthermore, as Passini (2007) corroborates, games can be adapted to explain the concepts being worked on, as reinforcement or as assessment.

The aims of this article are to discuss the use of games in the teaching and learning process and their importance in Geography teaching, to build a game that covers the main rivers of the Amazon and to analyze the feasibility of using the game built for elementary school students. The pedagogical experience was conducted in activities carried out by teachers in training linked to the Institutional Teaching Initiation Scholarship Program (PIBID).

Games and Geography: a possible partnership

Throughout history, lessons in basic education have undergone transformations, evolving into more interactive formats and diverse methods for improving skills and competencies in the classroom. Therefore, nowadays, it is imperative that teachers are creative individuals, able to facilitate their students' learning in a simple and practical way, making use of a variety of resources and techniques. Thus:

> Although the scenario outlined above seems far away, it is now more than necessary to think about using different techniques and languages for teaching, enabling students to develop new skills. Teaching should be based on

research, investigation and the creation of the best technique for students to grasp and understand the content (Verri; Endlich, 2009, p. 69).

Within the vast range of methodologies and materials available for adoption, games represent versatile resources that can be used both to introduce content and to arouse interest in knowledge, engage students in the subject, and even for assessment and learning. In other words, games can be applied before, during or after the exposition of certain subjects. Studies, such as Sawczuk and Moura (2012), highlight that the use of games promotes the active participation of students in the teaching and learning process, as described by the authors.

> The use of games encourages students' active participation in school activities and is an effective tool in combating low academic performance and students' lack of interest in the educational process, taking into account their performance with games related to the programmed content (Sawczuk and Moura, 2012, p. 2).

Mafra (2022) observes that, during geography lessons, students show resistance to certain topics, considering them merely decorative and tedious. This results in a lack of involvement and, consequently, difficulties in developing knowledge. As a strategy to deal with this situation, she suggests incorporating educational games to engage students, thus promoting the teaching and learning process.

Games can certainly be used to cultivate fundamental skills before tackling specific geography topics, as indicated by Castellar and Moraes (2010). They highlight, for example, the importance of naval battle games as preparation for understanding the concepts of geographical coordinates. They also suggest using the game of checkers to address concepts of location, laterality and territorial domain, as well as

strategy games to help build geographical concepts.

A crucial aspect in the use of games, as emphasized by Breda (2018), is the classification of materials in relation to the grade, age and specific characteristics of each class. The author stresses the importance of knowing the students and understanding their cognitive development, avoiding introducing activities that are too childish or overly complex, which could demotivate students. In order to arouse the interest and attention of the class to the material used, the games must be attractive, creative and curiosity- provoking.

Mastery of the class is fundamental to the successful implementation of a game. It is therefore necessary for the teacher to have control over the class and clearly understand the game's proposals, thus allowing students to develop skills, have fun and, at the same time, build their knowledge.

> Without having built reasoning mechanisms that allow them to analyze and reflect on the world around them, it is questionable whether children will have the chance to develop autonomous personalities from an intellectual and moral point of view (Seber, 1997, p. 203).

It is crucial that the teacher is familiar with their class and understands that incorporating games will trigger an emotional response. Therefore, it is essential that they know how to deal with the feelings of all the students after the game has finished, since the winning group and the losing group will express different emotions. The teacher must intervene in order to avoid conflicts within the classroom and encourage the collaborative and enjoyable aspect of the games.

One important aspect is to ensure that the game is aligned with the school curriculum, with the themes and content covered in Geography. This is crucial if lessons are to lead students to develop geographical

reasoning. As stated by Nogueira and Carneiro (2009, p. 29), "in order to build this geographical reasoning, which is involved in the formation of spatial-citizen awareness in school practices, it is important to revalue the specific principles of Geography, which are instruments for analyzing this scientific domain" (p. 29). In this context, the proposal is for the game to incorporate at least some of these geographical principles.

Methodological procedures

The methodology used in this study is qualitative and involves the development of a game, followed by its application in the classroom. During this application, we carried out detailed observations of the students' behavior and also applied questionnaires to understand their perception of the material developed. It is therefore an applied study that investigates the use of games in Geography classes, with a focus on the rivers of the Amazon.

After building the game, the material was tested with the participation of 16 teachers in training, who were part of the Institutional Teaching Initiation Scholarship Program (PIBID) of the Geography Course at the Amazonas State University (UEA), and 2 permanent teachers from the Amazonas State Department of Education (SEDUC/AM). It was only after the analysis and reflective evaluation of these participants that the game was applied to basic education students.

The games were implemented in five classes, covering the eighth and ninth grades of elementary school, belonging to the state public school system. This application took place in the east of the city of Manaus, during the month of November 2023.

To assess the pedagogical viability of the game, various aspects were analyzed in interaction with the students. The following elements were considered: the game's ability to arouse students' interest, effective

participation during its execution, doubts and curiosities expressed by the students, clarity in relation to the rules established and the playing time, as well as its effectiveness in achieving the proposed pedagogical objectives.

At the end of the game, the classes were asked the following questions to obtain feedback: 1) Were you motivated to take part in the game? 2) Were the rules of the game clear and understandable? 3) Would you suggest any adjustments to the game? 4) Did the game achieve its objectives? These questions were designed to obtain a comprehensive assessment of the students' experience and identify possible improvements or adjustments needed to improve the use of the game as a teaching tool.

Figure 1: Research procedures.
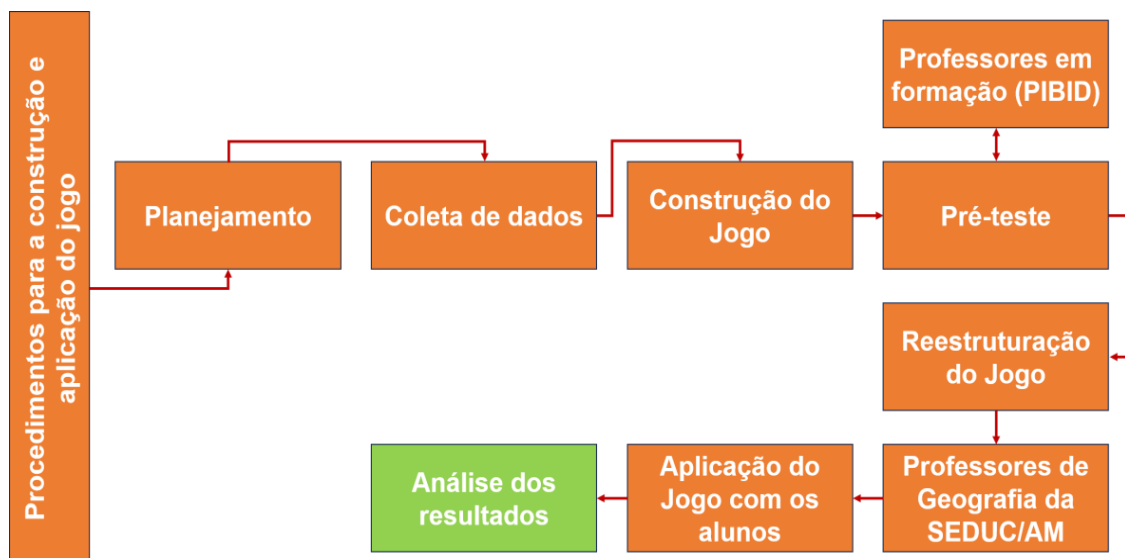
Source: Prepared by the authors (2023).

Super trump card for the rivers of the Amazon

The game "Super-Trunfo dos Rios da Amazônia", created by the project, is an adaptation of a game by Grow Jogos e Brinquedos Ltda, originally designed to make learning geography more fun, involving countries and information related to their physical and human

aspects. The game consists of 30 cards, each containing information about a specific Amazon river. Each card includes images and data on its length, the number of municipalities bordered by the river, the number of main tributaries and the altitude of its mouth. The cards were drawn up based on the organization of this data in a table, serving as the basis for the construction of the game (as shown in Chart 01).

Table 1: List of rivers and their characteristics

Name of the river	Length (km)	No. of municipalities	No. of tributaries	Altitude of mouth (m)
Amazon River	6400	32	24	0
Negro River	2250	09	12	29
Acre River	1190	03	04	81
Madeira River	1450	06	09	20
Purús River	3382	05	09	19
Tapajós River	840	06	06	24
Javarí River	1184	01	02	43
Jarí River	790	01	02	24
Igarapé Tarumã Açu	70	01	13	30
Aripuanã River	870	02	04	22
Igarapé Água Branca	7	01	14	50
Branco River	560	02	05	22
Igarapé do Mindú	18,2	01	34	51
Japurá River	2100	08	13	42
Urubu River	430	03	10	24
Içá River	1645	03	08	24
Tefé River	350	01	05	24
Xingú River	2700	02	08	26
Iriri River	1151	0	02	143
Tocantins River	2640	24	10	26
Trombetas River	760	01	04	24
Araguaia River	2627	03	12	115
Nhamundá River	470	02	04	24
Ituxi River	640	0	02	43
Tarauacá River	715	03	16	94
Curuá River	450	0	02	203
Uatumã River	660	03	01	28
Iaco River	480	01	17	104
Mamoré River	1930	02	06	90
Juruá River	3000	10	20	40

Source: Prepared by the authors (2023).

The information shown in Table 01 was collected using the *Google Earth* platform. We used the measurement tool, clicking on the map at the source and mouth of each river, to obtain data on the total length of each river.

In the process of identifying the number of municipalities bordered by each river, we followed the entire course of the river in the *Google Earth* image, from its source to its mouth. We analyzed the platform's satellite images to identify each municipality along the river's course. The same strategy was used to determine the number of tributaries of each river. We chose to count only the tributaries that could be easily seen in the satellite image when it was configured with a viewing scale bar of 10,000 meters (as illustrated in Figure 02).

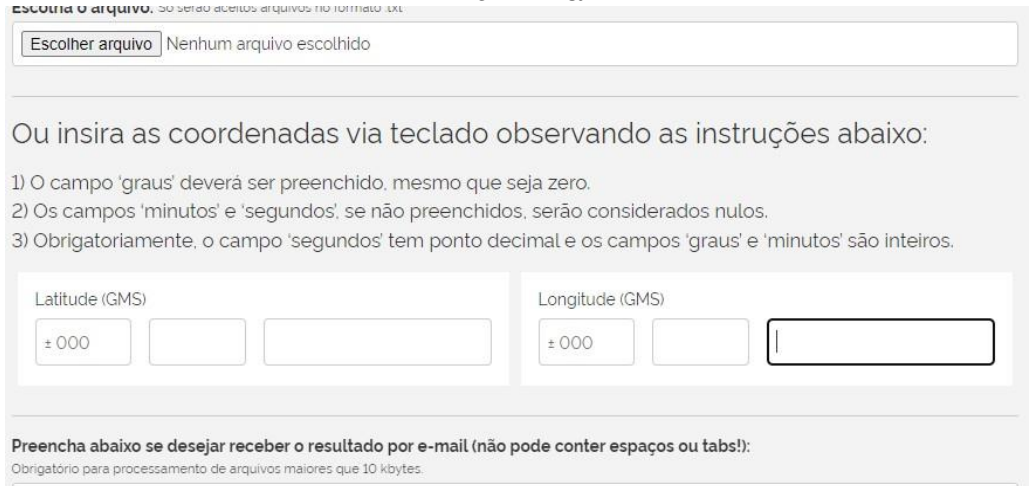**FIGURE 2**: Google Earth platform used to count the number of tributaries
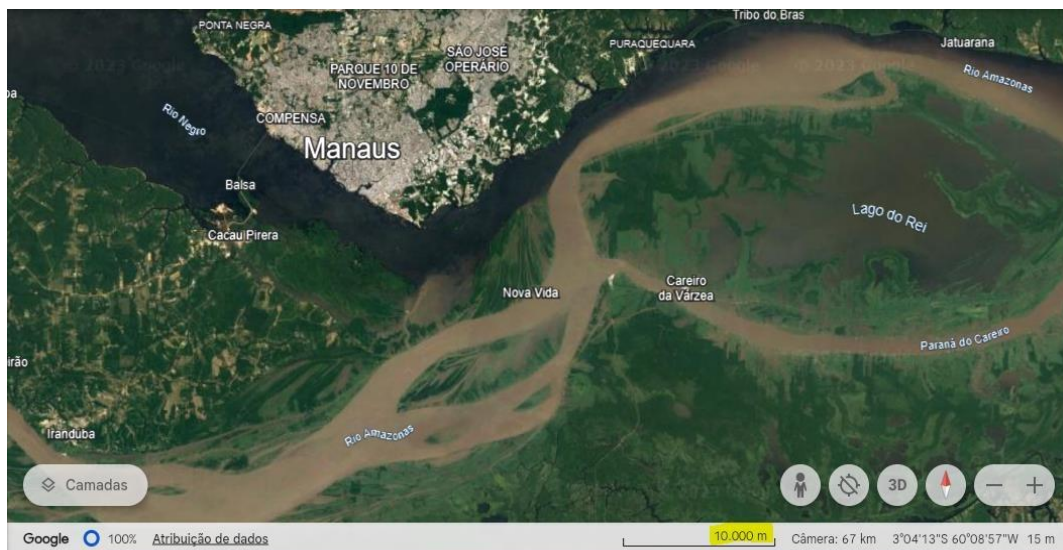
Source: Plataform Google Earth, https://earth.google.com/web/search/rio+amazonas/@-3.15518302,-60.00382325,31.6862713a,67683.50897337d,35y,-0h,0t,0r/data=CigiJgokCYoKmrUw4_I_EXtX5MDvcMA_GfwD-p9GrEjAIblntJ_nxknA Seen in 28/11/2023.

The altitude of the mouth was defined from the altitude of the ellipsoid provided by the platform. After identifying the coordinates of the mouth point, we calculated the conversion factor on the IBGE website (figure 03), using the formula: HN = h - η, where HN=GPS altitude - (-
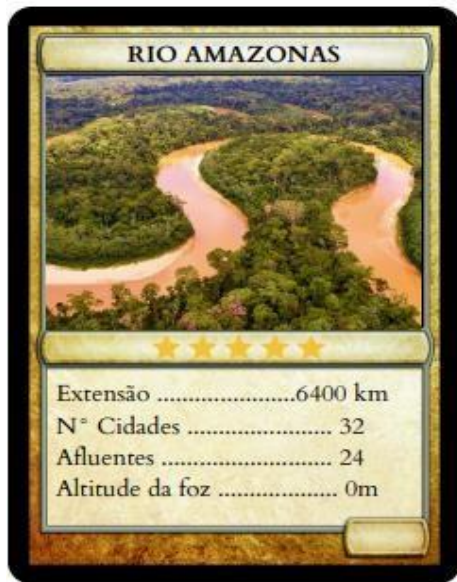
12.44) to then find out the real altitude.

FIGURE 3: IBGE website, for converting altitudes taken from Google Earth, to obtain the conversion factor for application in the formula

After this data acquisition process, 30 charts were produced, each chart containing data related to a river (Figures 4 and 5).

FIGURE 4: Demonstration of game cards

Source: Prepared by the authors (2023)

FIGURE 5: Demonstration of game cards

Source: Prepared by the authors (2023)

The game is easy to understand and follows simple procedures. Initially, the cards are distributed equally among all the players, and any leftovers are not used during the course of the game. Each player keeps their stack of cards face down, without seeing the information on them. The starting player is determined by a method such as odd or even.

Whoever starts the turn draws the first card from their pile, chooses an attribute from the four shown on the card and declares it out loud. The other players also draw the first card from their piles, revealing the name of the river and then the value corresponding to the attribute chosen by the first player. A comparative analysis of the data is carried out, and the player with the highest value becomes the winner of the round. The winning cards are added to the bottom of the winning player's pile.

This process is repeated with each new turn. The winner of the "Amazon Rivers Super Trump" game is the one who has accumulated all the cards at the end of the game.

Analysis of results

The objectives outlined for the design and application of the game in the classroom were comprehensively established:

a) Develop a game about the rivers of the Amazon and their characteristics, covering both those that are widely recognized and those that have been less explored in previous research.

b) Explore the rivers of the Amazon in the classroom in a playful and practical way, integrating them into Geography lessons in an engaging way.

c) Make it possible for students to compare and associate knowledge between the different rivers of the Amazon, promoting an understanding of the principles of comparison and analogy.

d) Analyze the feasibility of the game to be used in basic education

geography classes, assessing its effectiveness and potential impact on the teaching-learning process.

After being developed, the game underwent preliminary tests with students enrolled in the Geography degree course, as well as with two teachers from the Amazonas State Department of Education and Teaching Quality - SEDUC. No adjustments were reported during these tests, indicating the game's successful approval in the preliminary evaluation phase.

On first contact with the material, the students showed great enthusiasm, since Super Trump is a widely recognized game, although rarely used as an educational resource. Given the students' familiarity with this type of game, the explanation was simple for most of them, including those who had never taken part in such an activity.

When the game started in all the classes, the competitive impulse was noticeable, leading some students to ignore even the prizes, focusing only on the quest for victory. Before the game was played, all the information on the cards was discussed in class, ensuring that the students were familiar with them at the time of the activity. This procedure was essential to ensure that the game was not seen as a simple collection of cards with irrelevant information, but rather as a resource for learning about the hydrography of the Amazon.

The game effectively accomplished what it set out to do, developing, sharpening and improving specific knowledge about the various rivers in the Amazon region.

A frequent question in all classes was: "Why does the Amazon River, which is the largest in everything, have such a low mouth?" Not only did this question open up space for a more in-depth explanation of the topic, but it was also seen as a positive sign, indicating that the students were raising questions and applying the knowledge they had acquired, rather than simply completing the activity as an assignment for a grade.

Another satisfactory point was the active participation and engagement of the students. In classrooms, it's common to see some students who are more dispersed and involved in other activities. However, throughout the game, all the students showed active, attentive participation and, above all, communicative skills. This dynamic during the activity is a promising indication of its impact on student development. In addition, many students expressed questions during the experiments about the possibility of using this methodology again, demonstrating the students' interest in and receptiveness to this type of approach.

Data was collected during the application stage of the game by means of questionnaires and observations, especially during the sessions in which the 8th graders were involved in the dynamics of the game. All the participants were able to conduct the activity smoothly, and the average time taken to complete the game was 13 minutes. This time interval demonstrates that the game can be easily incorporated into a regular lesson, which reinforces the practical viability of its implementation in the educational context.

It was observed that the game was particularly effective and well received by the students in classes characterized by limited participation and predominantly expository lessons. With the change in lesson methodology, it is worth noting that different students stood out in the class, both in terms of engagement and application of reasoning during the activity.

The application of the game resulted in significant student engagement, making it clear that there was an increased interest in information about rivers. After the game, there was a growing curiosity, with students seeking information about the specific location of certain rivers and their respective mouths. This moment not only provided an enriching dialogue, but also stimulated socialization among the students themselves and between them and the teachers,
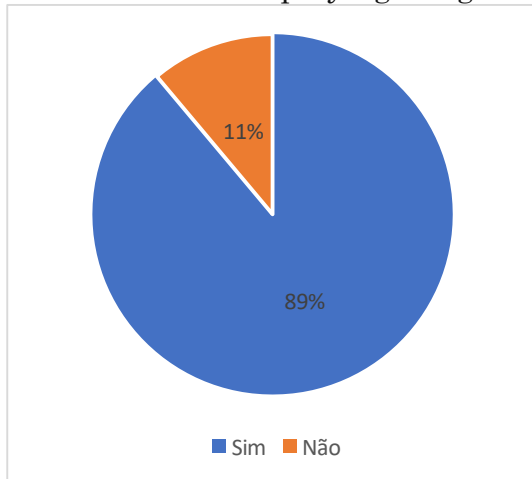
contributing to a more collaborative and interactive environment.

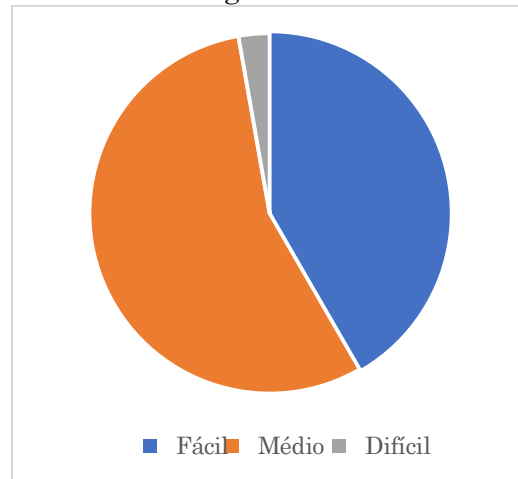**FIGURE 6**: Playing the game with the students

Source: Authors (2023).

FIGURE 7: Did you feel motivated when playing the game?

Sim Não

Source: Authors (2023).

FIGURE 8: How difficult is the game?

Fácil Médio Difícil

Source: Authors (2023).

Figure 07 shows that the majority of students felt motivated while playing the game in class. However, resistance is noticeable, as 11% of the participants indicated that they did not feel motivated when playing the game. This position can be attributed to the persistence of the tradition of a more conventional approach in the classroom, in which

the teacher is perceived as the holder of all knowledge, while the students play a passive role. Faced with a different methodology, some students may not readily recognize that the learning process can manifest itself in different ways, with them taking on a more active and participatory role in the construction of knowledge, as is evidenced in the learning through games approach.

With regard to the rules and procedures of the game, 17% of the students expressed difficulties in immediately understanding how to play. This suggests the need to create an instruction card to improve the dynamics of the game. This proposal could give the groups more autonomy to start the game, reducing their dependence on the teacher at this early stage. This approach could also facilitate the students' entry into the activity, allowing them to better understand the game's guidelines and promoting a more fluid and autonomous experience.

It is worth noting that when asked whether the game was interesting and creative, 91% of the students answered in the affirmative, demonstrating the good acceptance of the material created.

The students were remarkably divided when asked how difficult the activity was (Figure 8). This observation highlights the importance of recognizing the uniqueness of each individual, with their own facilities and challenges in developing skills and competences. It also shows that each student has a unique relationship with the subject of Geography and with the teacher.

It is crucial to take these individual variables into account when interpreting the results related to difficulties, since the perception of difficulty can be influenced by personal and contextual factors. However, it is important to emphasize that these perceptions do not seem to be an impediment to carrying out the proposed activity. Understanding individual nuances and taking these aspects into account can help to adapt teaching strategies to meet students' specific needs, promoting a more inclusive and effective learning environment.

In the survey conducted with the students, they were asked if the game had aroused any curiosity. Most of the participants said yes, expressing a desire to deepen their knowledge of the region's rivers. They were interested in finding out information such as the size of the rivers in the Amazon, the geographical location of each river shown in the game and the position of the mouths of these rivers.

With regard to suggestions for improving the game, the participants proposed including more rivers to extend the duration of the activity, and reinforced the idea of having an instruction card, as mentioned above.

When the students were asked about the possibility of learning through games, all the participants, i.e. 100%, answered in the affirmative. Once again, this reflects the excellent acceptance of the game as an educational tool.

When it came to evaluating how long the game lasted, just over half of the students said that the time allotted was considered sufficient, as shown in Figure 09. This observation suggests that, in general, the majority of participants perceived an adequate balance in the time allocated to the activity.

FIGURE 9: How long did you think the game was?
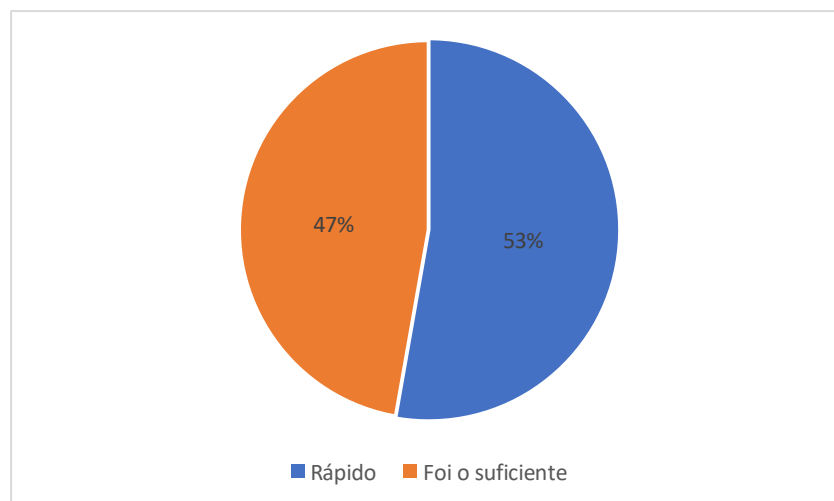
Source: Field survey (2023).

As can be seen in Figure 9, 47% of the students felt that the duration of the classroom game was sufficient, while 53% said it was quick. The average time of the matches was 13 minutes, allowing for socializing after the games and clarifying any doubts. It is worth noting that, due to the excitement of most of the students about the game, many expressed the desire to play more than once, since, according to them, "they weren't having class". This enthusiasm contributed to the perception that the game went quickly for many participants.

Discussion of results

The pedagogical use of games, as mentioned above, has proved to be a significant tool in Geography classes. This was confirmed through the application of Super Trump of the Amazon Rivers, whose pedagogical objective is to encourage students to establish analogies between the different rivers and to broaden their knowledge of the region's geography.

The *Amazon Rivers Super Trump* game played a significant role in improving the students' knowledge of the region's rivers. Some participants reported that, before the game, they didn't know the names of the rivers, but after the activity, they were able to name some. This result is in line with research by Canto and Zacarias (2009), who also point out that students show greater interest in games of chance in which they don't necessarily have to answer questions, which is similar to the format of the proposed game, in which students were challenged to compare data characteristic of rivers. This playful approach proved to be effective in promoting learning and student engagement in relation to the geographical theme being addressed.

According to Breda (2018), it is crucial to pay attention to the classification of the game. In the specific case of Super Trump, it was developed and adapted for use in Primary II, which contributed to the positive

reception by the classes.

When implementing the game, it was possible to see that, although the majority took it well, some students did not find it motivating. Some showed resistance to the use of new techniques, possibly due to their familiarity with the traditional approach of lectures and assessments at the end of the content presented.

The students evaluated the activity as a whole, providing suggestions for improving the game and sharing their impressions of the experience of playing and learning simultaneously. With regard to the game's level of difficulty, more than 50% rated it as "medium", approximately 40% as "easy" and only 3% as "difficult". This data is significant, since the degree of difficulty of games influences how challenging the experience is for players, which can have a positive impact on engagement in the activity.

The evaluation of the game as having medium or difficult difficulty is related to the finding that knowledge about the Amazon is little covered in classes, as pointed out by Mafra (2019). This is due to the lack of didactic resources that explore the Amazon region, combined with the complexity of carrying out didactic transposition on this theme.

The game *Super Trunfo dos Rios da Amazônia* plays an important role in filling this gap in teaching materials focused on the Amazon. It helps the region to be discussed more comprehensively in primary school classrooms, allowing students to get to know their home region better and making it easier for teachers to teach their classes.

Final considerations

In this research, the objectives outlined were fully achieved, in particular the construction of a game involving the rivers of the Amazon and their distinctive characteristics, the recording of information little explored in other works, the association between the

rivers, applying the geographical principle of analogy as recommended in the BNCC, and the analysis of the viability of the game for use in basic education.

The practical application of the activity went satisfactorily in each class, within the time stipulated for a standard lesson. The students not only achieved the aim of the game, but also the established pedagogical purpose, demonstrating the relevance of the approach.

The most relevant results of this research include the significant approval of the game by both teachers and students, validated through questionnaires applied after the activity was carried out in the classroom. This validation reinforces the viability of the game as an effective tool to be used in the classroom, contributing significantly to the teaching-learning process.

The practice of using games has proved to be efficient in the context of basic education, highlighting the importance of carefully selecting the material to be introduced into the classroom. In addition, it is possible to support the importance of the teacher's ability to guide the students during the application of the game, since this approach significantly alters the routine of the lessons. The activity, unlike traditional lectures, provided pleasure for both the trainee teachers and the students, involving emotions that simulate real-life situations, such as winning and losing, and entertainment accompanied by the learning of topics and information. In this way, educational games emerge as a resource that contributes to the maturity of classroom dynamics.

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