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ARTIGO

GAMIFYING LITERACY: USABILITY AND READING EXPERIENCE IN THE GRAPHOGAME APP

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ABSTRACT: The goals of this article are twofold: assessing GraphoGame Brasil's usability and analyzing the reading experiences proposed by the application in a series of lessons based on phonics instruction. Results show that, in terms of usability, the application presupposes a user who is familiar with technology; in some cases, children needed the help of an adult to navigate the app because the initial images and animations did not provide enough information for them to use it independently. When it comes to the reading experience proposed, it is clear from the first lessons that the app mostly emphasizes repetition of sounds and identification of phonemes-graphemes without much context. This strategy can also be verified in the app's other exercises.

Keywords: gamification, literacy, teaching, reading.

GAMIFICAÇÃO NA ALFABETIZAÇÃO: USABILIDADE E LEITURA NO APP GRAPHOGAME BRASIL

RESUMO: Os objetivos deste artigo são duplos: avaliar a usabilidade do GraphoGame Brasil e analisar as experiências de leitura propostas pelo aplicativo em uma série de aulas baseadas na instrução fonética. Os resultados mostram que, em termos de usabilidade, o aplicativo pressupõe um usuário familiarizado com a tecnologia; em alguns casos, as crianças precisaram da ajuda de um adulto para navegar no aplicativo, pois as imagens e animações iniciais não forneciam informações suficientes para que pudessem utilizá-lo de forma independente. No que diz respeito à experiência de leitura proposta, fica claro desde as primeiras aulas que o aplicativo enfatiza principalmente a repetição de sons e a identificação de fonemas-grafemas sem muito contexto. Essa estratégia também pode ser verificada nos demais exercícios do app.

Palavras-chave: gamificação, alfabetização, ensino, leitura.

GAMIFICACIÓN EN ALFABETIZACIÓN: USABILIDAD Y LECTURA EN LA APLICACIÓN GRAPHOGAME BRASIL

RESUMEN: Los objetivos de este artículo son dos: evaluar la usabilidad de GraphoGame Brasil y analizar las experiencias de lectura propuestas por la aplicación en una serie de lecciones basadas en la enseñanza de la fonética. Los resultados muestran que, en términos de usabilidad, la aplicación presupone un usuario familiarizado con la tecnología; en algunos casos, los niños necesitaban la ayuda de un adulto para navegar por la aplicación porque las imágenes y animaciones iniciales no proporcionaban suficiente información para que pudieran usarla de forma independiente. En cuanto a la experiencia de lectura propuesta, desde las primeras lecciones queda claro que la aplicación enfatiza principalmente la repetición de sonidos y la identificación de fonemas-grafemas sin mucho contexto. Esta estrategia también se puede verificar en los otros ejercicios de la aplicación.

Palabras clave: ludificación, alfabetización, enseñando, lectura.

INTRODUCTION

This article discusses the process of gamifying the teaching of literacy through an exploratory study of the GraphoGame Brasil app. We aim at assessing the app's usability and at analyzing its first gamified reading lessons. We also analyze how reading is taught in the game and how these lessons are in keeping with the PNA (Política Nacional de Alfabetização or National Guidelines for the development of Literacy) (BRASIL, 2019), which favors phonics as the main method for the teaching of literacy in Brazil.

GraphoGame Brasil came into being after the Brazilian federal government launched the PNA which stimulates the adoption of the phonics instruction for the teaching of literacy, aiming at the development of phonological awareness, systematic phonics instruction, oral reading fluency, vocabulary development, reading comprehension, and writing production, all of which are regarded as essential to the development of literacy. The Brazilian federal government sees the game as a resource to promote playful literacy training on the relationship between written language and their corresponding sounds in oral language.

Bearing this in mind, this article analyzes GraphoGame Brasil's usability, paying close attention to the knowledge required of its users (children) so that they may reach the app's goal: increasing phonological awareness. We also analyze the literacy method adopted with special emphasis on the game's pedagogic strategies, the way learning takes shape through exercises, and whether the app helps teachers with the teaching and learning of literacy.

To analyze the app, first we had to download, install, initialize it, and set it up. We followed the "first steps" set of instructions, which is the information that introduces the player to the game. Later, we explored all set-up options for both the initial screen and the digital environment, then finally began exploring the first lessons. We did all that after we became more familiar with the app's system.

As a record, we captured screenshots of GraphoGame Brasil as we played it. The research categories were defined to meet two investigative goals: 1) regarding usability, we wished to understand what the child users would need to know to play the game; and 2) the adoption of phonics instruction, PNA's main strategy to develop literacy in children.

This article is divided into 4 sections. Section 1 discusses the importance of games in the learning process. Section 2 describes the GraphoGame app and addresses its usability to teachers and children who are learning to read. The third section analyzes the first lessons in the teaching of reading. The last section presents the conclusion of this study.

GAMIFICATION IN LITERACY

Gamification has had a pivotal role in contemporary society, especially in schools (LAURENTI et al., 2009) due to the increased use of Digital Technologies (DT) and Digital Games (DG) in a modern society that has seen the rise of a digital culture (LÉVY, 1999).

Digital technological devices, especially games, are an integral part of children's everyday lives and can be used for both entertainment and education. In Brazil, access to digital technologies has been unequal, and, as a consequence, children from public schools do not have easy access to DT devices (such as computers, tablets, or smartphones) whether they need them for homework assignments or entertainment.

Alvez, Minho and Diniz (2014) maintain that gamification means the use of games in situations that were not originally gamified. Bearing this in mind, we can say that GraphoGame Brasil aims at creating, in reading lessons, a challenging, pleasurable, and entertaining learning environment. The authors (2014) highlight that in these gamified environments players can learn more, become more creative and increase attention levels.

DTs can be seen as an innovative approach to children's learning processes, especially for those who are learning to write as DTs can contribute to the cognitive development of those children. Because of this, DTs are becoming more popular in schools, indicating that pedagogical practices are evolving and becoming more innovative. Together with the use of the DTs, DGs have also become more popular not only in school environments, but also outside schools. Guimaraes *et al.*, (2016, p. 05) state that:

instructional digital games allow for the learning process to cease to be associated with the school environment, transcending the school walls. As they can be present in places where electronic devices are allowed, they contribute to deterritorialize school Spaces (GUIMARÃES *et al.*, 2016, p. 05).

Games are dynamizing devices that help teachers during the learning process, as they can also be used in non-school environments, adapting themselves to children's social and cultural reality.

The word 'game' comes from the Latin word *jocu*, which means to play, to make fun, to have fun (PINHEIRO et al., 2018). As playful activities, games have rules that need to be interpreted and followed by players. They can be used for different purposes, in-school learning among them. Those activities can, in turn, become more effective with the mediation of a teacher, which involves redirecting teaching practices.

A child begins to acquire the alphabetic writing system in order to increase their literacy (SOARES, 2016), which can be defined as the use of written language or writing in a variety of social practices that take place at school and in other contexts. The social uses of writing take shape through the experience of reading and writing in print or in digital media. In order to ensure that learners can adequately relate literacy knowledge specific to both print and digital culture, teachers tend to favor pedagogical strategies that employ different resources to enhance learning, including games.

According to Vieira (2012, p. 48), when a teacher considers

the initial steps of the process and the need to address the demands identified through a diagnostic test on children's previous knowledge of the subject, the use of the language game box (a series of diversified activities) becomes a good learning opportunity. Using these activities, a teacher can cater to the needs of all students at the same time, as the activities are planned and used according to a group's varied needs (VIEIRA, 2012, p. 48).

When proposing pedagogical activities that may or may not involve technology, a teacher needs to make sure they are taking into consideration the fact that the learning process is a student-centered activity involving students' previous knowledge, their current cognitive development stage, their linguistic knowledge, and their playful use of language in games or activities. Saveli and Tenreiro (2011, p. 130) explain that

for this to happen, it is essential for teachers to recognize that games and playful activities are a means of investigating and constructing aspects of the social and cultural environment to which a child belongs. It is also crucial for the teacher to see the child as an active and creative agent in the construction of knowledge and to plan activities that might be significant for the children (SAVELI; TENREIRO, 2011, p. 30).

The use of games (analogical or digital) to develop literacy involves autonomy, collaboration, concentration, attention, the ability to formulate hypotheses, and the analysis of discursive interactions. These processes promote both written and digital literacy.

Games also rouse in players an interest that goes beyond their learning needs. Faced with this type of experience, children who are learning to read and write experience the playfulness which exists in this stage of their cognitive development. DGs help and motivate students to acquire and memorize rules, and the assimilation of images, sounds and concepts (RIBEIRO; COSCARELLI, 2009) play a central role in the development of literacy.

Games aim at providing players with a motivating environment in which cognitive development can happen in a pleasurable and effective way. In these environments, challenges become the stimuli that foster learning through play. Games need to be used bearing in mind that they are promoting learning that stimulates learners cognitively and intellectually, allowing them to acquire the skills required for reading and writing (RIBEIRO; COSCARELLI, 2009).

In pedagogical practices involving technology, teachers become agents of a structural change of viewpoints and knowledge of literacy practices. In this sense, DGs become elements that can transform traditional teaching practices, providing both children and teachers new forms of teaching and learning which are more autonomous and can take place in different times and spaces, thus deterritorializing the place for learning acquisition and promoting a paradigm shift by challenging the idea that knowledge is exclusive to schools. Learning can take place in different environments, including DGs, which used to be frowned upon by teachers for introducing playfulness as a means of conceptual exploration (GUIMARÃES *et al.*, 2016).

Games become a means for a child to learn effectively, integrating their previous knowledge with the ones acquired and produced in their learning environment. Using games to develop literacy can be an innovative and diversified way of employing learning resources that promotes deeper knowledge systematization and reconstruction. This happens because games provide players with opportunities to experience playfulness, which involves the many possible meanings and conceptions of a single action, thereby promoting the development of mental schemata and thus contributing to a broader construction of knowledge. In this context, playing and learning become two sides of the same coin, one needing the other to exist (GUIMARÃES *et al.*, 2016).

GRAPHOGAME BRASIL

The GraphoGame Brasil app was developed by Brazil's Ministry of Education (MEC) and is part of the Time to Learn program (Tempo de Aprender) and of the aforementioned PNA (BRASIL, 2019). According to the government, the app aims at aiding teachers to develop literacy¹ in children aged 4 to 9 years old. The app is available for Android, Microsoft and IOS devices.

¹ Literacy is the body of knowledge, skills and attitudes related to reading and writing (BRASIL, 2019).

Figure 1- Installing Graphogame Brasil



Source: screen capture by the authors, 2021.

The app is based on a series of studies on reading conducted by Finnish researchers. In order to make the app available in Brazil, the federal government had help from the Brain Institute (Instituto do Cérebro), located at the Catholic University of Rio Grande do Sul (Pontifícia Universidade Católica do Rio Grande do Sul – PUCRS) and responsible for adapting the Finnish app to Brazilian Portuguese.

GraphoGame is comprised of 49² sequential lessons which are unlocked as the game progresses. As the game can be played offline, that is, without an internet connection, it can be used by children who do not have internet access at home or in schools without a reliable Wi-Fi connection – which is the case for a great number of public-school students.

Figure 2 shows the app’s first screen. In terms of usability, after downloading and installing the app, a user can visualize a menu with the following information: (I) settings; (II) player settings; (III) privacy policies; (IV) exiting the game.

Figure 2 - First screen of *GraphoGame* Brasil



Source: screen captured by the authors, 2021

² See http://alfabetizacao.mec.gov.br/images/graphogame/pdf/graphogame_at.pdf

In this first menu, options are shown as icons whose symbols are familiar to game players and smartphone app users. The gear icon is used for the settings³, that is, the app's main operational functions. An emoji icon redirects users to the player's settings, which allow players to save their own personal information.

The privacy policies button is represented as a sheet of paper accompanied by a padlock. This button shows the app guidelines, its use information and specific legislation. The open door button allows users to quit the game. At the left bottom corner, an arrow allows users to go back to the main menu.

In terms of usability, it has been observed that the layout of GraphoGame Brasil's initial screen is not particularly child-friendly, and thus children can have difficulty intuitively accessing the app. A game for children who are learning to read and write needs to have screens that are objective and self-explanatory (RIBEIRO; COSCARELLI, 2009), as these children are not proficient readers just yet. Hence, game information or game instructions must make use of multimodal and multisemiotic resources such as images, sound, and cartoons.

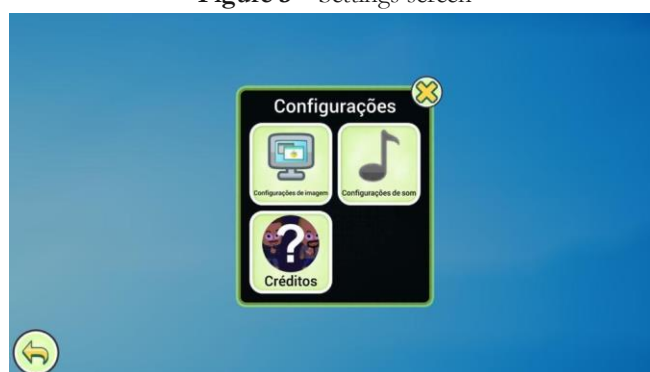
The game offers multimodal stimuli (verbal and non-verbal). In some cases, a player will hear a phoneme and be asked to relate it to the corresponding letter. The alternatives are presented as falling balls, amongst which players are to select the correct one. It is expected that “without the assistance of an adult, children are able to understand what they are supposed to do. We must remember that the use of online games directly correlates to a player's degree of literacy” (RIBEIRO; COSCARELLI, 2009, p.13).

Because children already belong to a digital culture (LÉVY, 1999), these platforms must help enhance their existing digital literacy, and thus games will be mere conduits for the intended learning.

It is essential that games articulate learning contents' goals, for they are digital learning resources based on a set of foundations and structured around learning goals, which must cater to children's learning needs (PINHEIRO; CAVALCANTE; AMORIM, 2018).

The GraphoGame settings screen is shown in Figure 3:

Figure 3 – Settings screen



Source: screen captured by the authors, 2021.

By clicking the first option of the menu in the settings icon (represented by a gear; see Fig. 2), users can access a second menu with the game's main settings, such as: (I) image settings; (II) sounds; (III) credits. In the image settings button, one can choose screen resolution and the speed at which information is presented. In the sounds setting, it is possible to choose the volume for action effects and the game's soundtrack.

³ Those are the app's settings such as language, brightness, and fonts.

DGs have a structural logic comprised of 3 elements: the plot, the engine, and the interactive screen (GUIMARÃES, 2016). The plot defines the game's theme, story, and goals. Finally, a sequence of events is revealed as a new phase in the game is achieved.

The engine is the tool which controls the actions and reactions of the game's environment, interfering in players' decisions; it can be compared to a thermometer of the emotions provoked in the different levels of the game. Through the interactive screen, information exchanges occur as the player communicates with the game's engine; a relationship is formed as the player establishes an entrance path, which becomes responsible for their actions in the platform (the screens of the game), and an exit path, comprised of audiovisual responses and environment changes (GUIMARÃES et al., 2016).

Figure 4 – A player's files



Source: screen captured by the authors, 2021.

By clicking on a player's settings, it is possible to access that player's files (Figure 4); this button saves all app usage data, such as: total playing time, the duration of each lesson, last access, progress, most recent level, and the percentage of finished levels. Regarding players' gender options, there are two (Fig. 5).

Figure 5 – Choosing a player's gender



Source: screen captured by the authors, 2021.

After choosing their gender, the next screen allows players to create an avatar to represent the child in the virtual environment. The first step is to choose a name, which can be typed into a text box. Player settings options are shown in Figure 6:

Figure 6 - Player settings



Source: screen captured by the authors, 2021.

The next tab asks players to specify a game mode, which is defined by whether the game is being used at school or at home. The app does not make it clear for users what the differences between these two options are or what might happen if a player makes a random choice.

In order to use GraphoGame Brasil, a user needs to set a password:

Figure 7 – A player's password

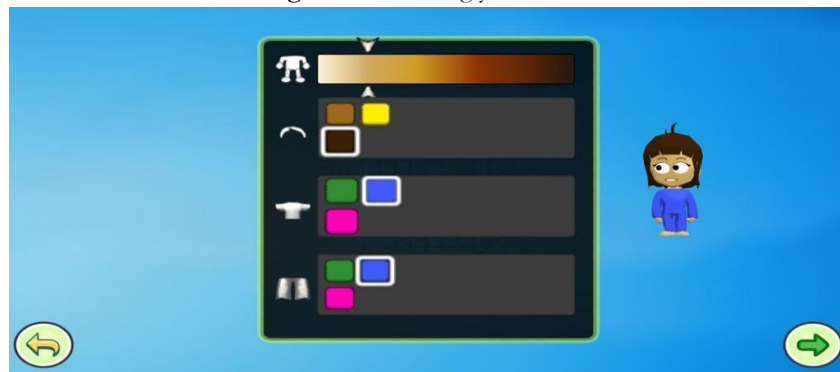


Source: screen captured by the authors, 2021.

After selecting the game mode, such as 'stars for school use', a player will be prompted to choose a three-digit code. Although this code is comprised of icons and numbers, children may find it difficult to memorize all the steps to reach this tab, as well as the codes they will have to enter every time they use the app. For these reasons, players will need an adult to help them select a game mode and set up a passcode.

The player's avatar can be created according to pre-defined settings, shown in Figure 8:

Figura 8 – Creating your avatar

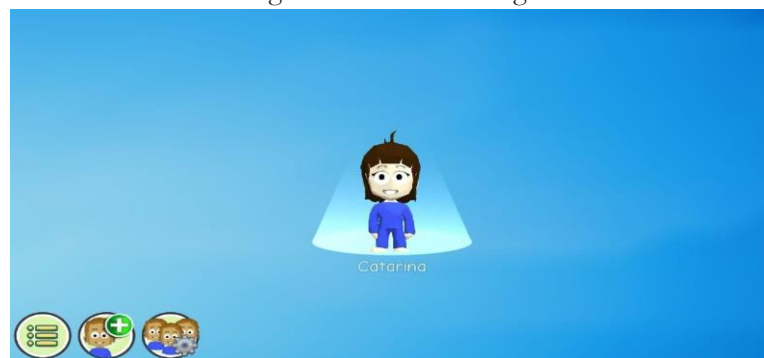


Source: screen captured by the authors, 2021.

When creating their avatar, a child can choose the features of the dummy that will represent them in the game. The avatar functions as an interactive interface between the player and the game, representing the player onscreen and doing the activities proposed in the lessons.

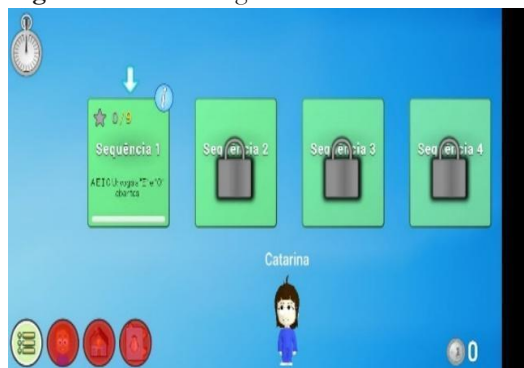
Figure 9 shows a screenshot of the game’s starting screen, with the avatar set up and ready to start playing.

Figure 9 – Avatar settings



Source: screen captured by the authors, 2021.

As players progress and achieve the goals proposed by the plot of the game, they are rewarded with coins, badges, and custom objects they can use to further customize the avatar. Thus, the avatar is constantly changing depending on a player’s interest. Initial avatar settings are shown in Figure 8: skin and hair color, and clothes. When their avatar is ready, a player can move forward by clicking on the horizontal arrow located in the right bottom corner of the screen. When a child does that, the app shows players the activity menu depicted in Figures 10 and 11:

Figure 10 – Unlocking activities

Source: screen captured by the authors, 2021.

Figure 11 – Locating activities

Source: screen captured by the authors, 2021.

The activities menu has 3 icons representing the first lessons. By touching the smartphone's screen or by using the arrows, the avatar begins to move and initiates the chosen activity. To make progress in the game, it is not enough to understand the activities; children must also employ digital literacy competences: reading icons, dealing with the technical dimension of the digital sphere, realizing how to use the arrows, and deciding which mental strategies they will choose to finish the lessons.

In order to set up their profile in the GraphoGame app, a user needs a set of skills hardly mastered by children in the process of acquiring written language. For this reason, they will often need the help of an adult to understand what they are being asked to do – for example, the information required in the screens shown in Figures 6 and 7.

Even though there are images and animations, a player needs to be literate to navigate the initial screens and to define game settings.

In terms of usability, the game presupposes a player who can read and also understand its interactive mechanisms. Thus, there is a certain level of difficulty in the competences required to set up GraphoGame. Going back to the main menu, it is possible to obtain information about the avatar, total game duration, duration of each level, last access, first access, and overall game progress.

GRAPHOGAME'S FIRST LITERACY "LESSONS" AND PHONICS INSTRUCTION INDUCTION

Instructional games that aim at developing literacy need to present language in context, allowing global meaning to emerge, whether in real or imaginary situations (RIBEIRO; COSCARELLI, 2009). Therefore, instructional literacy games should provide meaningful, contextualized interaction, so that written language can be learned through lessons that turn out to be significant, real life experiences, and not mere training sessions in phonics instruction.

GraphoGame uses phonics instruction to help children learn how to read. The game's Teacher's Book states that the app should be seen as an aid and not as a substitute for teachers. It also reinforces the PNA's main learning goals, such as the development of phonological awareness and alphabetic knowledge. Phonics instruction aims at teaching, in a systematic and explicit manner, the letters of the alphabet, especially the correspondence between a phoneme's sound and its graphic representation, allowing learners to master the written system through sounds and syllables. According to Seabra and Dias (2011, p. 312), phonics-based approaches "systematically and explicitly teach, with increasing levels of difficulty, graphophonological decodification and phonographemic encoding skills together with the development of phonological awareness".

Overall, GraphoGame uses phonics to teach reading. Players are prompted to practice and repeat sounds, and to memorize their graphic representations. As mentioned, the game consists of 49 sequential lessons, including sequences of multiple-choice tests. The first lessons present, separately, the sounds of vowels, consonants, and of two vowels together. The next set of lessons introduces two-letter syllables, then three-letter ones, and more difficult combinations as the game progresses (MANUAL DO PROFESSOR, 2021)⁴.

In phonics instruction, the learning unit consists of sound and graphic representation, that is, the phoneme-grapheme correspondence. According to Soares (2016), both phonic and syllabic instruction are known as synthetic methods because they highlight the importance of phonetics and rely on speech-based analysis to teach reading, leading children to learn the names of the letters of the alphabet. The guiding principle of phonics instruction is the learning of written language through the smaller units of the language (phonemes) and their correspondence to larger units (graphemes) (SOARES, 2016).

Proponents of phonics instruction argue that phonics makes it easier for children to orally break up words into phonemes, which they claim is necessary to effectively learn how to read on the grounds that it would enhance learners' awareness of the sound-graphic representation correspondences. Another point to consider is the encoding and the decoding of words, or the skill of breaking up words into phonemes, which is a very reductive way of understanding phonological awareness, as it only means memorizing the phoneme-grapheme correspondence (MORAIS, 2006).

Phonological awareness researchers and proponents of phonics instruction believe that the units of oral and written language (phonemes-graphemes) are organized in the same way in the minds of children and of super-literate adults (MORAIS, 2006). Because of this, phonics instruction tends to lead learners to pronounce each phoneme of a word separately, which is a reductionist and fragmentary approach to knowledge, as not every child learns in the same manner.

Morais (2006, p. 11) considers that “making a learner pronounce every phoneme of a word separately – is an antinatural and unacceptably complex task for someone who did not take an undergraduate-level phonetics or phonology class”. For him, “treating it as a prerequisite for literacy is to promote exclusion or, at least, to create an unnecessary cognitive overload for the few learners who were able to survive the method” (2006, p. 110).

The app's first lesson introduces the sounds of the vowels, based on the principles of phonics instruction. However, when playing, children need to wear headphones, as the game uses short, robot-like sounds that are difficult to understand; therefore, in order to avoid compromising children's listening and subsequent associations, it is important to block out other sounds and noises from the child's environment. Finally, it is important to point out that even without any interferences, the game's artificial sounds do not correspond to the sounds articulated by a teacher (SOARES, 2021).

⁴ The teacher's manual is available at http://alfabetizacao.mec.gov.br/images/graphogame/pdf/graphogame_at.pdf

Figure 12 – First activity



Source: screen captured by the authors, 2021.

The second lesson follows the same rationale of the first one; the only differences are the level of difficulty and the teaching of news sounds for the letters A; I; E; O, followed by a brief explanation. Players are first asked to listen carefully to the reproduced phonemes, then to find the corresponding graphemes.

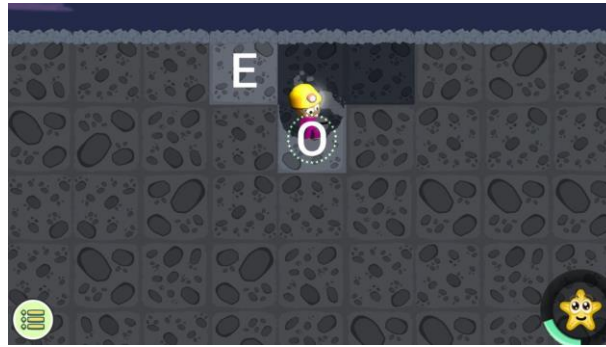
Figure 13 – First activity of lesson 2



Source: screen captured by the authors, 2021.

Exercise (S-2) repeats the same phoneme-grapheme content previously presented, attempting to reinforce knowledge through repetition, and is, therefore, a reinforcing activity. As highlighted before, phonemes and corresponding graphemes are introduced separately and without context.

Figure 14 – Second activity



Source: screen captured by the authors, 2021

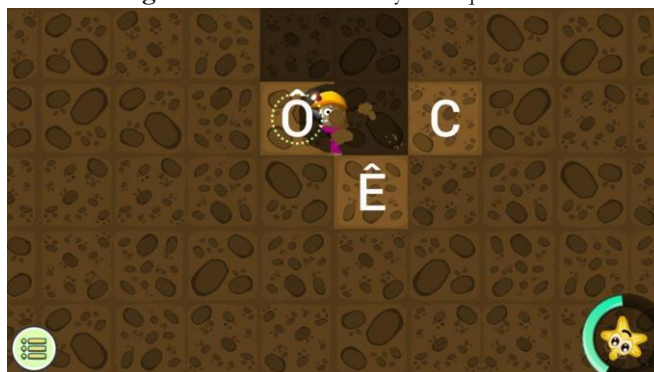
The first proposed lesson asks players to pay attention to the pronunciation of the phonemes (É, Ó) represented with diacritic marks. In this exercise, players are asked to listen to a sound and find the corresponding graphemes in a list of options shown on the screen. When players click on the phoneme that corresponds to the grapheme, the screen shows a series of balloons popping out.

Figure 15 – First activity of sequence 3



Source: screen captured by the authors, 2021

The second lesson of sequence 3 (S-3) introduces new phonemes (Ê; Ô; ã) represented with diacritic marks. Players are asked to perform the same actions as before (listening carefully to the sounds and finding the corresponding graphemes), just with a different interactive screen. All of these activities rely on practice and repetition.

Figure 16 – Second activity of sequence 3

Source: screen captured by the authors, 2021.

By analyzing these lessons, we learn that, in the app, “the core of phonics is the correspondence between sound and letter. Phonics relies on the alphabetic principle, in which pronunciation and writing require knowledge of the correspondence between letter and sound” (SAVAGE, 2015, p. 25). Therefore, as the game progresses, activities involve increasingly more complex knowledge of letters, consonants, digraphs, and the way syllables are formed.

PLAYING WITH WORDS: FINAL CONSIDERATIONS

It is legitimate to worry about whether children can effectively access GraphoGame, as a significant number of children who are learning to read and write do not have internet access. The fact that the game relies on phonics instruction to teach children how to read and write is also worrying.

GraphoGame has usability issues for children developing literacy. As shown above, it sometimes requires the mediation of an adult to help children navigate the initial screens, as the images and animation fail to provide enough information for a still largely illiterate player to use the app by themselves.

Although GraphoGame is probably meant to aid the development of literacy for all children, it ends up producing new forms of social exclusion and inequality; even if the app can be played offline, it would not be accessible for everyone due to the fact that many Brazilian families simply cannot afford to provide their children a digital device.

Whilst it is true that the project that created GraphoGame Brasil made important contributions to literacy instruction during the COVID-19 pandemic, the fact that reading is taught in a decontextualized way and without taking into account Brazil’s considerable linguistic diversity means a step back towards an approach that has historically failed in this country. It is important to remember that the app is being used in a linguistically, culturally, socially, and economically diverse country. To ensure significant improvements in literacy instruction, allowing subjects to participate fluently in the digital and written practices of our literate culture, what we need is the reduction of social inequalities and investments in teacher education and in schools

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DECLARAÇÃO DE CONFLITO DE INTERESSE

Os autores declaram que não há conflito de interesse com o presente artigo.

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