





GamAll: Playing Beyond Boundaries - Gamification and Multimodal Literacy

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Abstract. Interactive story apps are becoming popular, especially among children. Due to its multimodality, interactive story apps offer a good opportunity to promote the development of cognitive and language skills. Here, we present the theoretical framework and the initial design decisions that support the development of a pedagogical game, which aims at enhancing students' reading competences related to multimodal texts. The game complements Mobeybou in Brazil, an interactive story application directed to pre and primary school children and a digital manipulative that aims at promoting young children's literacy, especially focusing on the development of language and storytelling competences in the context of multiculturalism. The development of the game follows a design-based research methodology and a user-centered approach. The conceptualization and the development of the game, as well as of the Mobeybou story app, are informed by theories of embodiment, socio-constructivist and constructionist theories, as well as multiliteracies and multimodality theories.

Keywords: Gamification · Interactive story apps · Multimodality · Children playful learning

1 Introduction

Mobile devices have infiltrated our daily environment like no other previous technology before [20]. Their learning and interactive functionalities make them popular among young children, who often make their first contact with literature and other subjects through such devices [18]. Although interactive story apps have similarities to printed picture books, the multimodal nature of both is different: while the use of printed picture books predominantly implies a combination of the verbal and the visual modes, story apps usually include auditory, tactile, and performative dimensions [18]. Due to its multimodality, interactive story apps have the potential to offer a unique reading experience, stimulating and conveying information through the visual, auditory and sensory channels [14]. Given that the comprehension of an interactive story app requires specific reading skills and strategies, it is necessary to develop pedagogical materials and tools that support the development of student's reading competences related to multimodal texts.

Taking advantage of the opportunities offered by this new kind of text and the necessary skills to read a multimodal text, this study uses gamification concepts, inserted into a pedagogical game, to scaffold student's reading competences. The game aims at providing opportunities to expand and reinforce the knowledge developed during the reading of the story app in a playful way. In this paper, we present the theoretical framework and the initial design decisions that support the development of the game.

2 Gamification in Educational Contexts

According to Deterding et al., "Gamification is the use of game design elements in non-game contexts" [6, p. 2], even though gamification is sometimes misunderstood as learning through games [2]. At this point, it is important to highlight that this does not mean that learning through games is not possible. In fact, the notion of 'serious games' emphasizes such possibility: "A serious game is a game in which education (in its various forms) is the primary goal, rather than entertainment" [17, p.17]. However, gamification does not imply exclusively a game environment, since its aim is to encourage the user to use the gamified system [16], which can be a game, a task, a questionnaire, and so on. In other words, gamification aims to involve and motivate people through concepts normally found in games, such as feedback, route, score, and competition [7]. The effectiveness of gamification depends on the correct use of its concepts, which can involve participants to an extent that they willingly perform more complex and time-consuming tasks [2, 3]. Furthermore, gamification rather than just the use of game concepts, presupposes the use of game design [5].

2.1 Gamification Concepts

As referred in the previous section a gamified system is composed of concepts that originally belong to games [12]. Based on the orientation proposed by [12], below we list and explain the most frequently used concepts of gamification, that is, points, levels, achievements, feedback, ranking, missions, integration, engagement loops, customization, rules and narrative.

- Points: Are used to quantify the user's actions;
- Levels: Provide the perception of progress in the game;
- Achievements: Are visual representations of the objectives that have been reached;
- Feedback: Is a positive or an indicative reinforcement about the user's performance;
- Ranking: Is used for comparison between people who are participating in the gamified activity, often generating a feeling of competition among them;
- Missions: Are used to guide the user within the system and make it more interesting for her/him;
- Integration: Is the ability of the system to accommodate an inexperienced user or one who uses the system for the first time;
- Engagement Loops: Are techniques to keep the user motivated and willing to use the system again;
- Customization: Allows the user to modify specific items within the game environment according to her/his preferences;

- Rules: Define how the user should use the system, or which permissions s/he has;
- Narrative: Is used to guide the user and encourage him/her to act as expected.

Considering these concepts and guided by our learning goals, we select the concepts that best fit the purpose of our game. The selected concepts go beyond points, ranking and achievements since we use gamification as a learning scaffold and not to promote competition among the users. Therefore, from the concepts presented we chose seven to integrate in our game, namely, levels, points, achievements, feedback, customization, rules and narrative. The way in which these concepts were used will be clarified in Sect. 4.

3 Contextualization

This paper presents the motivation, design and conceptualization of a pedagogical game that complements an interactive story application, Mobeybou in Brazil, which is part of Mobeybou¹, a set of digital and tangible pedagogical materials directed to pre and primary school children [21]. These materials aim at promoting young children's literacy, especially focusing on the development of language and storytelling competences in the context of multiculturalism. The development of the materials and the game follows a design-based research methodology and a user-centered approach [1], involving the target users during several development phases in a cyclical process of designing, testing, redesigning and testing again. The conceptualization and the development of the materials are informed by theories of embodiment [11, 15], socio-constructivist [19] and constructionist [10] theories, as well as multiliteracies and multimodality [8].

3.1 Mobeybou in Brazil

Mobeybou in Brazil presents a story that narrates Iara and Kauê's adventures in Brazil. The application includes a geographical map of Brazil, a 360° environment that replicates a famous street in Brazil, the Avenida Paulista, a puzzle, a page with augmented reality and an incorporated glossary that explains keywords from the story. Children can choose to read the text on their own, listen to the story being read by the default narrator (which also functions as a model reading) or use the integrated recording function to create, record and listen to their own (or a family member or friend's) personalized reading. The recording function supports several audio files, which are then stored in the app. The map helps situate the country in the global world map, as well as the five Brazilian socio-demographic regions. Together with the conveyed knowledge about Brazil, e.g., location, food, traditions, the interactive areas, the 360° environment and the AR experience intend to promote a high level of body expressions and haptic interactions. Another important feature is that the meanings in the interactive story app are represented by different modes (e.g.: texts, images, sounds, animations, possibilities of interaction) having a complementary relationship and creating several layers of interpretation. It is possible to assert that this text is a complex semiotic ensemble, in which different semiotic resources (modes) are combined to create an orchestrated whole [13].

¹ <http://mobeybou.com/>.

Considering multimodality as one of the key meaning-making features in the design of digital texts [4], we argue that the comprehension of an interactive story app requires specific reading skills and strategies. In this sense, the pedagogical game presented in this paper represents one possible answer to this demand.

4 GamAll

4.1 Methodology

As previously referred, this investigation follows a design-based research methodology, encouraging collaboration between participants and researchers [1, 22]. Several methodological procedures are necessary in order to accomplish our main goal, such as: (i) conducting an extensive bibliographic research; (ii) establishing the learning goals; (iii) selecting the gamification concepts that are going to compose the pedagogical game; (iv) detailing how each concept will be explored during the game; (v) conducting the visual and graphic development; (vi) implementing the game (which presupposes a cyclical development focused on designing-testing-improving the game prototype); and (vii) validating the game through empirical investigation. The main learning goal is to scaffold students' reading competences of multimodal texts. Steps (iii) and (iv) are presented in the next section.

4.2 Description of the Game

The choice of gamification concepts to design the pedagogical game was motivated by some of the most cited concepts and the ones that have shown better results to engage and motivate the participants [9], as well as by our learning goals.

Considering the age of the target audience, pre and primary school children, the chosen concepts are easy to understand and do not encourage competition among users, but rather collaboration in order to achieve the goal of expanding and strengthening the knowledge developed through the reading of the story app. The game, still in the development phase, includes the gamification concepts presented below.

- Levels: The game is divided into five regions, (Fig. 1, left), which correspond to the socio demographic regions of Brazil. In each one, there are challenges that address specific characteristics of the region, expanding the information conveyed through the reading of the story app. It is important to highlight that the information about the regions is presented in the story through different modes (visual, aural and haptic), so the game also explores how each mode is understood (or not) by the user. The existence of levels, as presented in the previous section, brings a sense of continuity and progression in the game.

The design for the games in each of the five levels reinforces the multimodal approach. Level 1, for instance, prompts the users to identify objects that are presented mainly through the visual mode in the story (Fig. 2(I)). Level 2 invites the users to discover story elements that were presented through the interplay of verbal and visual

modes (Fig. 2(II)); Level 3 challenges the users to pair sound and object, exploring elements presented through aural mode during the story (Fig. 2(III)). Finally, Level 4 asks users to match animals and their habitats, addressing the information presented through the interplay of verbal, visual and aural modes (Fig. 2(IV)). Figure 2 presents the initial design for some of the game level's.

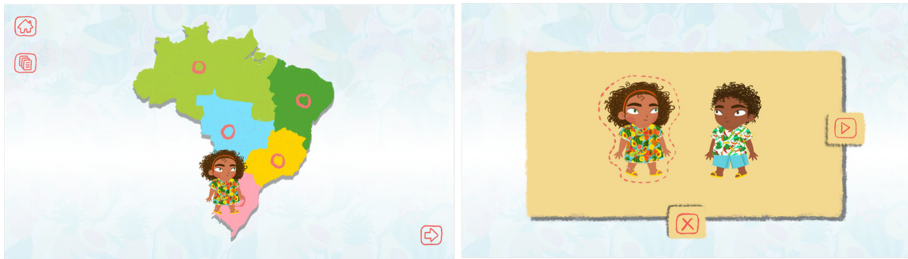


Fig. 1. The map with the levels of the game (left), characters' options (right)

- Customization: The participant will have the opportunity to choose one of two characters to accompany her/him during the trajectory of the game, (Fig. 2, right). S/he will also be able to choose the language (Portuguese/English) of the story, and, finally, the user can decide to listen (or not) to the oral narration. The possibility of customization is a way to help the user to identify with the game.
- Points: Regarding the points, we choose the star format, because it is simple and easy to understand, considering the target audience. The score is divided into three categories:

One star: If the participant does not successfully complete at least 60% of the challenges in a level, s/he will not be able to move to the next phase. So, s/he gets one star and is invited to read the pages about that region in the story app. After reading, the user can try to overcome the challenges again.

Two stars: When the participant gets enough points to advance to the next level, s/he gets two stars.

Three stars: If the user successfully completes more than 80% of the challenges on a level, s/he gets three stars. In this case, in addition to advancing to the next level, s/he receives a reward. The rewards are elements (characters, animals, objects, musical instruments) that are part of other story apps from the Mobeybou set of pedagogical materials.

- Achievements: As explained above, at the end of each level completed with three stars, the user receives a reward. Besides, at the end of the route, if the participant has three stars in all levels, s/he can access and download a file with augmented reality figures from another story app that are part of the Mobeybou pedagogical materials.
- Feedback: Along the game play the user will receive instantaneous feedback and, if necessary, an aid to improve the score, according to the number of stars collected at the



Fig. 2. Initial designs for the some of the game level's: (I) identifying objects related to the story (top-left), (II) discovering the story element (top-right), (III) pairing sound and object (bottom-left), and (IV) matching animals and their habitats (bottom-right)

end of each level. Depending on the users' performance, there will be different kinds of feedback, such as instructions that highlight the semiotic resources used during the meaning-making process, as well as hints that emphasize the relations between each mode, which will be presented during the different challenges in each level. Little tips of extra knowledge will be offered for the users that solve the game. smartphone

- Rules: The rules of the game are defined by the score the participant obtains at each stage, a minimum score is required to proceed to the next stage.
- Narrative: The character chosen in the customization will guide the user throughout the game. Besides, there is a narrative that contextualizes the levels and the challenges the users need to overcome.

5 Conclusion and Future Work

Technologies like smartphones and tablets are already commonly used in educational contexts. Besides, the multimodal nature of digital texts is present in most digital environments. Meanwhile, gamification has proven to be quite powerful as an assistive technique for students, when it comes to motivation and engagement.

In this paper we propose a dialogue between digital environments, multimodality and gamification for the development of a game that aims to reinforce the knowledge constructed through the interaction with an interactive story app for children. Future work includes: the development of various low-fidelity game prototypes that will be tested with the target users, aligned to a design-based methodology; the empirical research of the acceptance of gamification along with multimodality; and, as a final goal, the expansion of the developed game to a framework to guide the development of educational games to support multimodal reading skills.

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