Digital Games and Learning

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APRESENTAÇÃO

Os estudos e pesquisas presentes nesta obra permitem ao leitor obter uma visão teórica crítica clara e concisa do campo de conhecimento dos jogos digitais e aprendizagem em uma perspectiva interdisciplinar, tendo em conta a investigação de áreas como ciência da computação, psicologia, educação, neurociência e design de jogos.

Assim, este livro sintetiza 15 trabalhos relevantes para o estudo de jogos e aprendizagem, servindo como um guia para qualquer um interessado nesta temática, especialmente para pesquisadores, designers, professores, profissionais e políticos que querem entender, projetar ou analisar melhor a relação entre jogos e aprendizagem.

Estes trabalhos trazem a reflexão abordagens importantes, tais como: o uso de tecnologia como uma alternativa na maneira de ensinar, agregando mais interatividade e dinamismo durante as práticas educacionais; um jogo de plataforma instigante e divertido, envolvendo desafios matemáticos do Ensino Médio com o objetivo de aumentar o interesse dos alunos pelas aulas de matemática neste nível específico da educação; um apanhado histórico acerca da origem de jogos analógicos, a relação da sociedade para com os jogos, algumas de suas classificações que estão em maior quantidade no mercado atual como os “Eurogames” e os “Ameritrashes”, a hibridização destes jogos e a participação dos dispositivos móveis; avaliação das experiências de jogo em ambientes digitais e não digitais através de personalidades de jogadores em potencial, como seus jogos são estruturados e quais jogos atendem às necessidades de determinadas personalidades; estudo de tecnologias e os detalhes de implementação envolvidos na sua criação; um jogo em duas etapas para auxiliar na escolha de um curso de graduação onde a primeira etapa apresenta conceitos de forma lúdica e divertida e a segunda etapa explica os conceitos apresentados e sua importância; construção de um jogo focado em personagens míticos do folclore brasileiro de forma a compartilhar essa informação com alunos, motivar a discussão do tema e aumentar o interesse dos alunos pelo mesmo; um serious game do tipo Quiz dentro da temática “Urgências Endodônticas” que enfoque nas competências e habilidades que capacitam o cirurgião-dentista ao atendimento destes casos; uma avaliação heurística de um jogo criado para auxiliar crianças surdas na aprendizagem da língua portuguesa; uma experiência de negociação e desenvolvimento pela empresa Napalm Studios de dois advergames com características distintas; aspectos educacionais e de diversão de jogos voltados à educação; uma análise, a partir da perspectiva de estudantes do Ensino Fundamental, Ensino Médio e Ensino Superior, como o jogo digital pode contribuir no processo de ensino e de aprendizagem.

Aos autores dos diversos capítulos desta obra, meu agradecimento pela submissão de seus estudos na Editora Atena. Aos leitores, desejo que este livro possa colaborar e instigar uma reflexão mais aprofundada sobre a relação envolvente entre jogos e aprendizagem.

Ernane Rosa Martins

SUMÁRIO

CAPÍTULO 9

IMBUING AND EVALUATING MOTIVATION IN VIDEOGAMES: ACCOUNTS IN THE TEACHING OF BRAZILIAN FOLKLORE

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ABSTRACT: This paper discusses the building of a game centered on mythical characters of Brazilian folklore so to share such information with students, motivate the discussion of the subject and increase their interest about it. An approach that was taken due to the understanding that the presentation of the selection of characters and tales to the students, to improve their knowledge about them and to enhance their valuing for a neglected part of Brazilian culture, should be able to appeal to them so that it could reach those ends. For that reason, the game was developed with a strong basis on motivational techniques and concepts dealing with the creation of videogames and of instructional materials. This process, our assessment of the game as an environment that motivates early teenage students and our next steps on this approach are all detailed in this paper.

KEYWORDS: Brazilian folklore, videogames, motivation, learning.

RESUMO: Este artigo trata da construção de um jogo focado em personagens míticos do folclore brasileiro de forma a compartilhar essa informação com alunos, motivar a discussão do tema e aumentar o interesse dos alunos pelo mesmo. Abordagem que tomamos por entender que a apresentação dessa seleção de personagens e histórias para os alunos, para ampliar seu conhecimento do tema e sua valorização por essa parte negligenciada da cultura brasileira, deve ser capaz de despertar o interesse desses alunos para poder alcançar este resultado. Para tanto, a construção do jogo teve uma base forte em técnicas e conceitos de motivação voltados para a criação de videogames e de materiais instrucionais. Este processo, nossa avaliação do jogo como um ambiente motivador para alunos no início da adolescência e os próximos passos a serem tomados são todos detalhados neste artigo.

PALAVRAS-CHAVE: Folclore brasileiro, videogames, motivação, aprendizagem.

1 | INTRODUCTION

Brazilian schools have long seen to favor methodologies and learning topics that aim, near exclusively, to the ingress on superior education (MOEHLECKE, 2016; SANTOS,

2011). While this should not be disqualified, we believe that this over focus has led schools to approach mostly theoretical subjects, introducing students to very few topics regarding the country's cultural diversity or more practical aspects (MOEHLECKE, 2016; SANTOS, 2011).

In that sense, this paper contributes to the diversification of school's cultural curriculum by using the Information and Communication Technologies (ICTs) as a medium to the teaching of the myths of Brazilian Folklore while enhancing students' motivation towards the learning of this subject. An approach that takes advantage of their familiarity and eagerness to interact with ICTs, particularly videogames, and that resulted in the built of the game *Folclórica*, meant to teach about different myths of Brazilian folklore.

The next sections discuss the concepts underlying the development of this game. Section 2 discusses why videogames can act as learning tools, why they can motivate students and how these two concepts connect in respect to the motivational and teaching-learning techniques and concepts we employed.

Section 3 deepens the discussion about the game created. Highlighting its development, target audience, plot, characters and the ways by which it informs players and triggers their motivation. Section 4 discusses the testing of *Folclórica* with students, the collection of the data about their impressions about the game and the evaluation of this data. Last, Section 5 shows our final conclusions.

2 I WHY CAN GAMES TEACH AND HOW DO THEY MOTIVATE?

ICTs are a part of our lives. They largely define how our society works and are easily embraced by its members, especially the youngsters. They provide an environment rich with information while requiring the use of inductive reasoning to gather this information and put it to practice. A positive process that has the benefit to enable users to transform information into knowledge (SANTOS, 2011; VAN ECK, 2006).

This process is even stronger in videogames due to the sheer number of possibilities of their environments (created by the combination of different situations and virtual environments) and the regular use of rewards as responses to the efforts and successes of users. Traits that are very likely to attract the attention and commitment of learners (VAN ECK, 2006) and that assure videogames a place in education.

This allow us to introduce videogames in classrooms, an ICT that is common to the daily lives of students, that they can relate to and that will challenge them with tasks that have direction and purpose (PRENSKY, 2010), enhancing their will to engage and succeed in these tasks, i.e. their motivation.

In that respect, it should be noted that while many authors argue about the ways or even the possibility to motivate people (BORUCHOVITCH et al., 2013; BZUNECK, 2010; STEINMAYR; SPINATH, 2009) they all agree on the key importance motivation

has in the learning processes, as it affects one's desires and whishes in unique ways. Among the factors listed by those authors there are two recurring ones that we approach here: the teaching of subjects far removed from the daily lives of students; and the gap between the lecture/test teaching model and the needs of apprentices born and raised among ICTs.

2.1 Learning through videogames

The lecture/test model of teaching is favored by most institutions to this day. However, it offers students very few opportunities to analyze and to interpret real-world problems or even hypothetical ones. This lack intensifies on high school years, which focus almost exclusively to prepare students to ingress on superior education or labor market (MOEHLECKE, 2016).

The room for changing comes from a 2011 list of mandatory curricular topics set by the Brazilian government that includes themes like the culture and history of African-Brazilian and Indigenous people (MOEHLECKE, 2016). Themes that are to Cascudo (2013) – who is among the most important scholars of the culture and folklore of Brazil – two of the pillars the Brazilian folklore.

In view of that, we chose the ICT of videogames to approach the matter and to highlight how educational videogames, or Serious Games (LANDERS; CALLAN, 2011), are capable to achieve varying instructional feats by combining different digital learning practices into an attractive interface that can be tinkered with and explored in ways that comparable to that of an immersive tutoring space. The kind of space that has learning as the result of experimentation and might have knowledge as an outcome. An understanding that is closely related to Kolb (2014) and Kolb and Kolb (2009) Experiential Learning Theory, ELT.

ELT establishes learning as a process that shapes the current experience into knowledge by collecting its data and connecting it to previous experiences and understandings. In that, as Figure 1 shows, learning is seen as a non-stopping cyclic process, in which one continuously creates, tests and reformulates hypothesis to solve a problem.

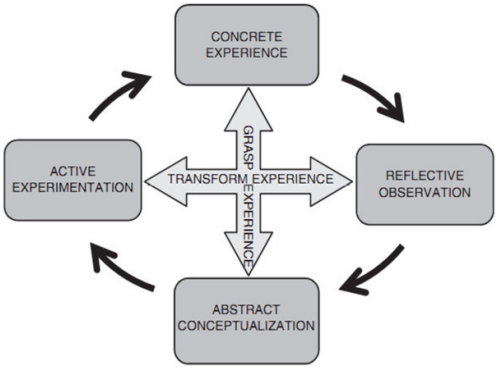

Figure 1: ELT cycle. Source: Kolb and Kolb (2009).

The ELT cycle is divided in two pairs of phases. The first pair is the grasping of the experience, which deals with the acquisition and comprehension of the experience. It is further divided into the *concrete experimentation*, when one uses the five senses to perceive their own world; and the *abstract conceptualization*, when one uses reasoning and analysis to interpret this reality.

The second pair is the transformation of the experience. In it, the new experience is shaped and linked to previous knowledge. It consists on the *reflective observation*, when one observes the performance of an experiment by others to understand it; and the *active experimentation*, when one takes an active role to perform a task to understand it and its results.

Interestingly, the way ELT holds learning is benefited by the environment of videogames due to the strong sense of immersion they seek to promote, which, in turn, provides ELT with a reality to sustain its model. Those environments also grant learners a safe ground for experiment, simultaneously enhancing their motivation and pushing them to further explore the environments and the tasks they provide (LANDERS; CALLAN, 2011; CASCUDO, 1984; 2013).

2.2 Motivation and learning

Motivation plays a key role in learning. An unmotivated apprentice studies very little (or nothing), thus, learning in the same amount. In that sense, when dealing with students' motivation in classrooms each learner must be regarded as a task performing agent, one that employs different competencies in the solving of cognitive problems (BZUNECK, 2009).

This view grants motivation a prominent role in the active involvement of students with learning tasks and the whole learning process. At the same time, learners who place minimal or no effort on this process are promptly labeled as (BZUNECK, 2009).

However, when labeling a student as unmotivated, teachers are mostly detecting underperformance, indiscipline, or other shortcomings in some aspect of their learning process. There must be caution in such labeling as it might not be the real cause of the issues faced by the student. Additionally, even when the student is lacking motivation the causes of the problem may be very diverse and be tied to factors that are either internal or external to the classroom or to the whole environment of the school (STIPEK, 1993).

Tackling one's motivation is not an easy task. Each person has their own unique interests affecting various aspects of their lives, which includes learning (HUANG; HUANG; TSCHOPP, 2010). For that reason, there is no exclusive definition for motivation, either for general or for learning purposes.

On the other hand, several authors have assembled lists of factors affecting motivation (BORUCHOVITCH et al., 2013; BZUNECK, 2010; STEINMAYR; SPINATH, 2009). When studying the lists compiled by those authors we identify two often factors: the teaching of subjects far removed from the daily lives of students; and, the gap

between the lecture/test teaching model and the needs of apprentices born and raised among ICTs.

Each student motivation is the outcome of their characteristics and the many aspects of the classroom's environment. However, booth previous factors are obstacles that interfere with those characteristics and environment and could lead to a weak or distorted motivation. An issue that requires the attention of teachers to be corrected (BZUNECK, 2009).

Folclórica was built as an attempt to aid teachers in this matter, looking to affect the motivation of students by tapping into their interest to be involved with the classroom activities and subjects. To that end, the game was built to instruct students and, as important as that, to be fun. A simple commitment, but often dismissed by academics when building educational games, that has led us to resort to the works of Malone (1980) and Malone and Lepper (1987).

2.2.1 Motivation in videogames, how to do it?

The works of Malone (1980) and Malone and Lepper (1987) are references to instill motivation in educational games (Serious Games) and we have adopted their guidelines in the development of the game. These guidelines are four components that must be balanced to assure the game's motivation regarding its level of fun: Challenge, Fantasy, Curiosity and Control.

As the guidelines lack a measurement tool we additionally resorted to Keller's (1987a; 1987b) ARCS motivational design model that consists of four components: Attention, Relevance, Confidence and Satisfaction. Thus, to assert that the built environment is capable of motivating students we tied ARCS components to the guidelines of Malone (1980) and Malone and Lepper (1987).

Within ARCS, *Attention* relates to how easily players engage and respond to the game environment. In our understanding, this mainly relates to the guideline of Challenge that shapes the environment's teaching subjects and encourages students to reflect on them. There is also a secondary connection to Fantasy, which, like *Attention* is strengthened by imagination.

The *Relevance* aids players to link new information to what they already know. It relies on Challenge to force players to reflect upon the new experience. However, Curiosity plays an even bigger role in *Relevance*, as it makes players wonder about the game mechanics and plot and to experiment with it.

The *Confidence* strengths good expectations on students about their performances. It seems to be evenly connected to Curiosity that builds up on players' expectations; Challenge, that limits what players believe they might accomplish through their skills; and Control, which sets the bounds on the actions that players can perform to act over the game environment or to avoid be the target of its interference.

Last, Satisfaction, which is the result of students putting to practice what they

have just learned. In traditional teaching settings *Satisfaction* is mostly restricted to late stages of the learning process. However, videogame environments enable its continuous manifestation regarding the players' progression on the environment. Which may be extra pronounced in specific game moments, like the solving of a difficult puzzle or the reaching of a new level.

Hence, *Satisfaction* is better connected to the guideline of Control, as it sets an upper limit to the number of solutions to any given game task. It is also connected to Challenge, as external motivators such as rewards or positive feedbacks can be used to recognize or praise players' efforts.

The combination of the ARCS model to Malone (1980) and Malone and Lepper (1987) guidelines provided a valuable tool to imbue motivation on our game, to assure its level of fun and to enable the measurement of this motivation. This assessment comes from Keller's (1987a; 1987b) IMMS (Instructional Materials Motivational Survey), a 36 items questionnaire that measures motivation regarding each component of the ARCS model.

2.2.2 Measuring the motivation in our game

The IMMS is a 36 items questionnaire for measuring the motivation in instructional materials using the ARCS model (KELLER, 1987a; 1987b). Each item of the questionnaire links to one component of the ARCS model. When assessing the motivation instilled in them by the instructional material, learners answer each item with an integer value ranging in a given interval. Here, being from zero (absolutely false) to eight (absolutely true).

In that respect, the IMMS offers the possibility of a qualitative and quantitative analysis, providing consistent statistical data that, at the same time, can be interpreted to understand which aspects of the game have to be improved to better fit the interest of most of its target audience.

The version of the IMMS we use was adapted by Huang, Huang and Tschop (2010) for measurements in educational videogames. The writing of this questionnaire was further adapted by us to better fit the understanding of the age group of our target audience, with no harm to its original structure and meaning and can be found in Carvalho, Barone and Bercht (2016). The results we gathered from this questionnaire and our analysis of them is show in Section 4.

3 I THE GAME

Folclórica (CARVALHO; BARONE; BERCHT, 2016), Figure 2, is a game that presents students to different tales and characters of Brazilian folklore. Linking these stories into a cohesive narrative that informs students and grasps their attention. The game is a 2D single player platform/puzzle game that has levels inspired by real

geographic settings of Brazil. It was built using the Unity 3D Game Engine[1] and the C# programming language. The game's first level was completed and tested. Another four levels are on development. Each of them standing for one of the five geographic regions of Brazil.

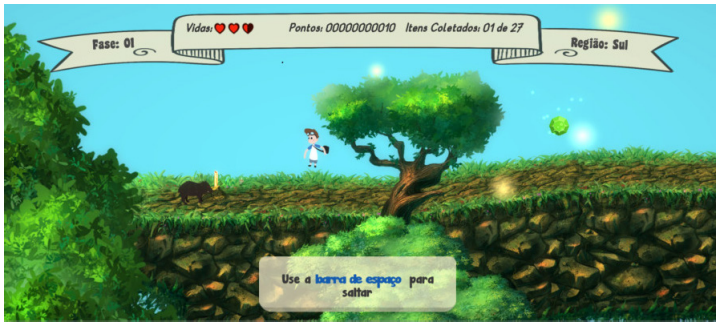

Figure 2: Screenshot of Folclórica's first level. Source: the authors.

Folclórica was introduced as part of the Literature subject of the Portuguese Language discipline, of two eighth year classes (the last year of middle school), of the Colégio de Aplicação (CAp) of the Federal University of Rio Grande do Sul (UFRGS) that have students ranging from 13 to 15 years old.

From the start, the game was met with enthusiasm by the teacher of the target discipline, who saw it as an opportunity to contribute to their students' valuing of the Brazilian culture and to provide them with an interesting reference against all the information regarding the myths and legends of foreign cultures, which they are often exposed to inside and outside of school.

That matter is important as, according to their teachers, there is a lack of didactic material about Brazilian folklore and the better opportunity to discuss it in classes aids to improve the valuing, recognition and appreciation of the identity, history and culture of the different roots of Brazil (FERNANDES; FERREIRA, 2009; BRASIL, 2005). As it leads students to reflect on the teachings of these cultures, to understand their connections to our society and, consequently, how they are related to them and to their lives (FERNANDES; FERREIRA, 2009).

3.1 Game development

Folclórica was developed by the authors and the group of undergraduates from the Computers Tutoring Information Program, or PET (*Programa de Educação Tutorial em Computação*), whose aid was very important and greatly reduced the required budget to conduct a research on game development, as their payment was conducted through scholarships. There was also the fundamental aid of the Portuguese language teacher of the testing groups.

Most game windows and level backgrounds were bought at the Unity Asset Store (https://www.assetstore.unity3d.com/). Cutscenes and game characters were drawn by an arts' undergraduate working as member of the project.

3.2 The target audience and the game importance

As stated, *Folclórica*'s proposal was well received by the teacher of the testing classes, as presenting the subject using a videogame offers a contrast to the information about the mythology of foreign cultures often available to learners, either by schoolbooks, lessons or leisure activities as movies, videogames, animations and books (LEARDINI; KOK, 2012; FERNANDES; FERREIRA, 2009). In fact, as we assessed on our first contact with the students, they indeed had more knowledge and care for the foreign tales than the national ones.

In that sense, developing and presenting this game to students between 13 and 15 years plays a social contribution to these apprentices, as it sets an interesting way to value the diversity of Brazilian culture and to challenge prejudices and stereotypical representations (LEARDINI; KOK, 2012). Promoting the reflection on how traits of these tales connect to different aspects of society and of their lives; like habits, language or celebrations (FERNANDES; FERREIRA, 2009). Like suggests the Curriculum Guidelines for the Education of Racial-Ethnic Relations (FERNANDES; FERREIRA, 2009; BRASIL, 2005).

3.3 The game plot and how it provides information

The plot of *Folclórica* follows a boy who had his younger brother taken away by the Cuca. Just before that he was playing o his phone and was constantly interrupted by newsfeed of strange occurrences, which people claimed were the work of beings of Brazilian folklore he did not known or cared for. After his brother was taken away, he meets the Saci who transports both to the world where the beings of Brazilian folklore live.

The Saci and the Cuca are two of the best-known characters of Brazilian folklore and have prominent role in the game's plot. Soon after they meet other beings of Brazilian folklore such as the Boitatá, the Shepherding Little Black Boy, and many others. While controlling the boy, the player interacts and dialogs with these many characters that present he or she their background and traits. In that way, the player learns about Brazilian folklore by talking to its beings, who also enlightens he or she about the problems going on both worlds, giving players the chance to interact with these beings in ways hardly achieved on other media.

In addition to that, players might also gather extra data about those beings, which becomes available through the Pause Menu screens of Figure 3. All that is combined with the game environment that gives players ways to internalize these experiences and to reflect on their meaning. Process that might result in learning and that is supported by Kolb's (2014) ELT, seen on Section 2.1, and by our views of the role motivation has on learning, Section 2.2. Approach that, as Section 4 shows, we believe was effective in enhancing students' motivation.

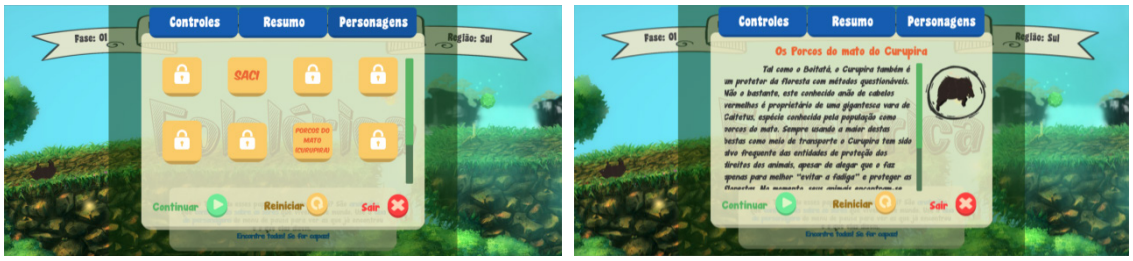

Figure 3: Information available to players on the characters tab of the Pause menu and its contents. Source: the authors

3.4 Game characters

the characters for *Folclórica* were chosen due to two aspects. First, the being should be related to the region of the country it appears in. Second, it should be possible to link its background or traits to the games' plot to keep its consistence. The creation of the characters' background resorted mainly to the works of Cascudo (1984, 2013) – arguably the most important author regarding Brazilian folklore – and García (2004; 2005). The first level of the game, the South Region of Brazil, depicts the following characters:

- *Black Faced Ox*: an amalgam of different versions of the tales of the Bum-ba-meu-boi. It speaks of an ox favored by its owner and killed by one of his slaves that was later revived. The Ox is often said to be always angry and to run wild through the land. The ox is mostly known by his lullaby "Ox, ox, ox, Black Faced Ox, take this kid who is scared of grimaces".
- *Carbuncle*: a small animal with a gem over its heads that grants wishes, which makes it often to be hunted and trapped by people, like the one seen in-game. It may give its gem to humble and good-hearted people.
- *The Charmed Ones*: beautiful sea nymphs from an island at the south of Brazil, they sing to attract men and sink their ships. Legend says they halted the practice when one of them fell in love.
- *Curupira's Wild Boars*: legend says the red-head dwarf Curupira protects the woods and commands a herd of wild boars riding the biggest of them. In-game, his command over the herd has been broken and the creatures endanger whoever comes close to them.
- *Shepherding Little Black Boy*: a slave boy left to die after being punished by his owner and that was saved by is godmother, the Virgin Mary herself. People them started to claim seeing the boy leading a herd on horseback, while looking for the lost goods of who light him a candle to his godmother. In-game, his candles are save-points (recover the player's lost progress).
- *Boitatá*: a giant snake that ate the eyes of the animals killed on a flood. The eyes burn with the light of the last sun the animals saw and give it control over fire. In-game, its eyes have been scattered by the Cuca, risking the near woods to catch fire.

The above characters have strong ties to region of Brazil seen on the first level, which also shows two extra characters (who have led roles on the game):

- *Cuca*: seen either as an ugly old lady or an anthropomorphic alligator the Cuca is known to steal disobedient children to eat them. She is the main antagonist of the game and responsible for the happenings on both worlds.
- *Saci*: a mischievous one-legged black boy who smokes a pipe and wears a red hat he can travel on whirlwinds and, when on good mood, might help others to look for lost goods. In-game, he gives the player information and saves he or she whenever the player falls from great heights.

3.5 The game connections to motivation

In Section 2.2 we highlighted the importance of motivation on the learning process and the need to improve it on students. This motivation is the result of the convergence of the preferences of each student and the possibilities (or lack of) that are offered by the classroom (BZUNECK, 2009).

In other words, the beliefs each student holds regarding the taught subject and what he or she trusts that might be accomplished from experimenting with it has weight on the interest and perception they attribute to the meaning of the tasks that they should perform (BZUNECK, 2009). Therefore, appealing to each student's individual belief of what they see as accomplishable touches their motivation and gives significant meaning to engage in such tasks.

To incite this appeal, we bring the folklore closer to the students' daily lives using videogames, which brings an extra benefit tied to Malone (1980) and Malone and Lepper (1987) guidelines: the concept of Fantasy.

Fantasy relies on imagination to create appealing circumstances that differ from one's daily routine. This is achieved by using attractive game settings, characters and plot to instill an emotional and affective appeal that prompt one to engage tasks and to demonstrate interest in them (*Attention*). Brazilian folklore vastly excels in Fantasy, having many situations and characters that may be adapted to game plots. Which gains strength when properly balancing game challenges to better appeal to players' *Attention* (KELLER, 1987a; 1987b). Fantasy is also a factor when translating the legends of Section 3.4 to the game environment to create meaningful stories that connect their traits and settings. Thus, inciting players' Curiosity (MALONE, 1980; MALONE; LEPPER, 1987).

This approach also ties the game plot to *Relevance* (KELLER, 1987a; 1987b), which when driven by players' Curiosity to explore and experiment the game environment influences their *Confidence* (KELLER, 1987a; 1987b). Mostly, players' Curiosity prompts them to tinker with the environment and to formulate and test hypotheses, enhancing or weakening their *Confidence* in response to what they believe is accomplishable. In turn, this establishes a link to *Control* (MALONE, 1980; MALONE; LEPPER, 1987), responsible to set the actions that may be performed by players when solving the tasks

that the game presents.

Last, players' *Satisfaction* (KELLER, 1987a; 1987b) is the natural result of their progression through the game and of their ability to grasp and use game mechanics to solve its challenges. In other words, it is the result of the successful combination of all forms of interaction seen in this section and that can be further enhanced by how they perceive their game score.

4 I METHODS AND RESULTS

The IMMS is Keller's (1987a; 1987b) tool for measuring motivation within the ARCS model, which we related to Malone (1980) and Malone and Lepper's (1987) guidelines. Each of the 36 items of the questionnaire are connected to one component of the ARCS model. There are 12 items for the Attention, 09 for the Relevance, 09 for the Confidence and 06 for the Satisfaction. At the time of the research our questionnaire was available online and was answered by 44 from both classes. They scored each of these items with values going from zero (totally false) to eight (totally true).

The ideal answer for each item (one or eight) varies regarding its proposition. We consider that the game succeeded in satisfying an item if students gave it an average score of at least 70% of its ideal score. The charts on the next sections show if the ideal score of an item is the maximum or minimum value by assigning, respectively, a (+) or a (-) next to the item number.

4.1 Attention

From the 12 items regarding Attention four did not met their average score (Figure 4): 22, 24, 29 and 31. The result highlights two issues our game design. First, the need to revise the game challenges, especially their variety and complexity. Both of which are strongly connected to Malone (1980) and Malone and Lepper's (1987) guideline of *Challenge*.

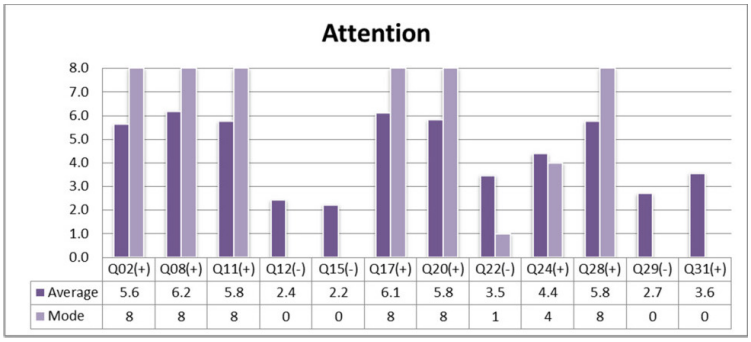

Figure 4: Average answers to IMMS questionnaire: Attention. Source: the authors.

Second, the amount of written information the game presents to students, which, as a rule, must be reduced. Resorting to more succinct texts and, whenever possible, removing and integrating their meaning to the game's challenges or mechanics. The

amount of in-game text interfered with the learners' ability to identify valuable information and, consequently, with Malone (1980) and Malone and Lepper's (1987) guidelines of *Fantasy* and *Curiosity*.

4.2 Relevance

From the 09 items of Relevance three did not met their average score (Figure 5): 16, 26 and 30. Among these, two point especially to the poor link folklore has with students: "16 – *The content of the game is relevant to my interests*"; and "30 – *I could relate the content of the game to things I have seen, done or thought about in my own life*". To these matters, *Folclórica* is, in itself, a contribution to their change.

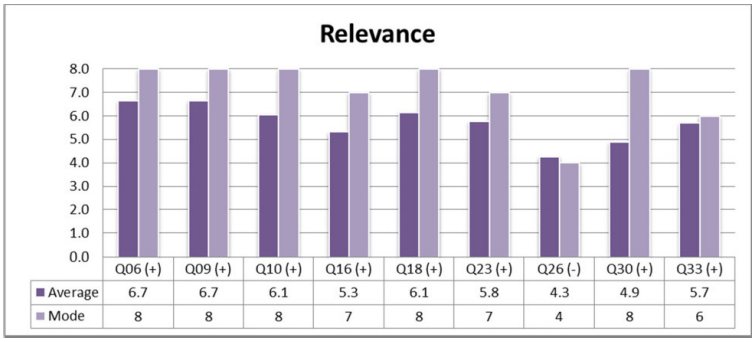

Figure 5: Average answers to IMMS questionnaire: Relevance. Source: the authors.

These items point us again to the need to find a better option to provide information about the game characters, as written text proved to have poor effect. In fact, although richer character information was available by finding and collecting the mini-biographies of characters, the data was poorly explored by students once they had collected it.

An approach that was well succeeded when employed on the game and that is being studied to further use was to integrate the main traits and behaviors of the game beings into its mechanics and flow, enabling players to simply absorb information by interacting with the game and its challenges. This approach was also able to create better connections between the game plot and the daily lives of students, as was seen on the reactions and conversations of students after the testing regarding the interactions with the Black Faced Ox and the Carbuncle.

Interestingly, the item 26 of the questionnaire suggests some care when handling such changes to the game. The item was underscored by students and states that "26 – *The game was not relevant to my needs because I already knew most of it*". The question this raises is "if the students say they already knew most of the subject, then how could they not be enough capable to relate it to their own previous reflections and knowledge?".

In this regard, it is our assumption that improving the integration of the information with the flow of the game will aid students to better realize the depth of that information. Inciting their *Curiosity* (MALONE, 1980; MALONE; LEPPER, 1987) in a stronger way and ending this apparent contradiction.

4.3 Confidence

From the 09 items of Confidence four did not met their average score (Figure 6): 03, 07, 19 and 34. Again, these items point mostly to an excess of in-game text, which cost the *Curiosity* (MALONE, 1980; MALONE; LEPPER, 1987) of students while they advanced through the game plot and scenario.

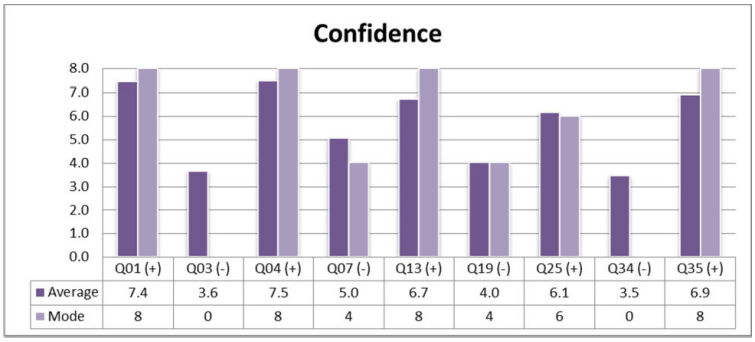

Figure 6: Average answers to IMMS questionnaire: Confidence. Source: the authors.

Another aspect inferred from these items is our often use of semi-hidden objects along the game levels. This overuse seems to have interfered with the feeling of *Control* (MALONE, 1980; MALONE; LEPPER, 1987) that players had over the game environment. According to these indicators and to the playability observed during the game testing, the *Control* may take benefited from breaking the game challenges into smaller steps, so that students can better understand how to solve them.

4.4 Satisfaction

From the 06 items of Satisfaction two did not met their average score (Figure 7): "14 – *I enjoyed the game so much that I would like to know more about this topic*" and "27 – *The wording of feedback after the exercises, or of other comments in the game, helped me feel rewarded for my effort*".

Particularly, item 14 reached very close to the average value, scoring 5.4 of a required 5.6. That becomes more interesting when considering the average scores of each item in respect to their testing classes. The class that had the pre-game lesson about the folklore (First Class), was the one which scored under the 5.6 goal. This makes us wonder if the pre-game lesson, which, despite granting students better context for the game world and the theme of folklore, might have made the game seem repetitive to students.

As for item 27, the use of feedbacks after the finishing of game tasks was indeed underexplored and consisted mostly of the game score and few dialogues of thanks between the player and some game characters. To better meet this need and the intended in-game text reduction we mean to use of iconographies and audios to highlight the efforts of players, the *Control* (MALONE, 1980; MALONE; LEPPER, 1987), in overcoming the game *Challenges* (MALONE, 1980; MALONE; LEPPER, 1987).

Figure 7: Average answers to IMMS questionnaire: Satisfaction. Source: the authors.

4.5 Students suggestions

to grasp the unique understanding students had of the game as well as of any perspective that the IMMS might not have covered, we placed and additional, non-mandatory, blank field at the end of que questionnaire so that students could add any suggestion they saw fit. As it was an optional field, only students that really had something to add about the game did fulfil it to give us extra feedback.

Eight students did fulfil the suggestions field. Curiously, the suggestions of students do assert the considerations we presented from Section 4.1 to 4.4, which highlights the importance of attending to these aspects to improve future versions of the game levels and narrative. Students stressed that, as with any testing, they liked to find game bugs as it made them feel a real part of the game development process. However, this feeling quickly changed for those students that happened to find too many bugs in their gameplay.

The use of audio as feedback was also suggested by some students, as well as the use of onscreen iconography to point commands during gameplay instead of onscreen text, which, according to them, was overused and made it difficult to discern what information was most important. Which, again, highlights the need of its reduction. Four of the eight students praised the game directly.

5 I CONCLUSIONS

We started this research aiming, to schools and to the teaching-learning experience two main contributions. First, to aid the better diversification of ICTs in classrooms by nearing these spaces to the technology of videogames, which is so common to their students, even if it, as Van Eck (2006) suggests, is still met with stigma by a diminishing number of educators.

Second, we meant to do that while giving students an immersive and interactive environment that shares significant information with them. In this case, regarding cultural aspects of the folklore of Brazil. In that, we not only meant to impact the performance of these students in their classes but, above that, to present them to an often-neglected

part of their culture.

All that, while inciting the commitment and predisposition of these learners to further and further explore the provided environment and granting them the chance to learn about the characters of Brazilian folklore through their interactions. That way, promoting a kind of contact that, as highlighted by their teacher, is hardly possible using other medias or teaching methods.

On that respect, the reactions of students during the game testing, their dialog with the teacher after it and the data we collected from them (thoroughly discussed on Section 4) indicate that *Folclórica* did met these goals. Awakening in these learners a bigger interest for Brazilian folklore, due to the use of the game's narrative and plot to present the theme to them and to the guidance of their teacher during the process. Moreover, the understanding of students that we would be using their opinions to improve the game, better shaping it to their needs and desires, reduced their skepticism about educational games.

Naturally, there is room for improvement. The testing of the first game level showed us its current problems and how to improve over them. Knowledge that will be carried on to the development of the remaining game levels.

Most of the detected problems are related to game design, which strengths the importance of such task and of the need in having experienced people conducting it, as that expertise would aid in taking better advantage of game mechanics and scenarios as storytellers. Therefore, reducing the amount of in-game text, facilitating the use of the game environment to share ideas and information and its overall interactivity, as well as possibly enhancing the game's feeling of immersion.

However, more than an effort of the development team of the game, the proper integration of those changes requires investment. This has always been one of the major obstacles to create the game and to implement some of the improvements pointed by students in Section 4, many of which, would require considerable financial investment to hire people with the needed knowledge.

Aside from the highlighted improvements, the collected data and the dialogs had with the teacher of the testing classes after the experiment made us wonder: would reversing the approach we employed with the testing groups have more interesting outcomes?

That way, students would first have contact with the subject through the game environment and, after that, take part in classroom debates about the information and topics they experienced in-game. This approach might improve the dynamic of internalizing the game's subject and avoid that students come to see the game as a repetition previously seen classrooms subjects, even if in a completely different manner.

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