

Teaching Brazilian folklore through videogames: a way to motivate students

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ABSTRACT

This paper discusses the development of a game centered on mythical characters of Brazilian folklore in order to disclose these characters and tales to students, improving their knowledge in regard to this theme and enhancing their value for a neglected part of Brazilian culture. To appeal to students we have instilled the design of the game with motivational techniques and concepts aimed to instructional materials as well as to videogames. By combining these two aspects our goal is to contribute to bring to classrooms a common and appealing technology of students' daily lives that is still seen with some stigma by some educators. At the same time, we will be providing students with an attractive environment that will keep their attention and engagement while pushes them forward to explore it further and teaches them about a subject that according to their teachers is short of learning materials of any kind.

Categories and Subject Descriptors

J.4 [Computer Applications]: Social and Behavioral Sciences – *psychology, sociology.*

General Terms

Design, Experimentation, Human Factors.

Keywords

Brazilian folklore, Videogames, Learning, Motivation.

1. INTRODUCTION

For many years, Brazilian schools, especially High Schools, have been seen (or even expected) by the population as employing methodologies and presenting contents that have the only goal of enabling students to ingress on superior education [29][34].

Naturally, we recognize the importance of this goal and it is not our intention to disqualify such efforts in any way. However, one must agree that by over focusing this goal schools have approached mostly theoretical subjects, with few subjects tackling the country's cultural diversity or more practical aspects [29][34].

The work shown on this paper brings a contribution for a more diverse cultural curriculum within schools, as it takes advantage of the Information and Communication Technologies (ICTs) to serve as a medium to teach students about the myths of Brazilian

Folklore and, at the same time, enhance their motivation towards the learning of this subject.

In fact, the idea of "improving student's motivation" for classes was the starting point for this research, as it was first brought together by the realization that teachers' complains about the lack of motivation of students for learning a subject or even an entire curriculum. This characteristics are very often found in academic literature [4][6][35][36].

In understanding that, we started to look for ways to improve students' motivation for classes at the same time that we teach them a subject. By considering the current generation of students' familiarity and eagerness to interact with ICTs we believed that that might be a suitable path to achieve those goals. Two concepts that, after considerations and discussions with teachers and researches about technologies and teaching topics, have led us to develop a videogame for teaching students about the myths of Brazilian folklore, which we call Folclórica.

The following sections discuss the concepts underlining the development of this game and provide a deeper comprehension of our choices. For this reason we start on Section 2 by showing the existing links between motivation and learning, while doing the same on Section 3 for the existing relationships between ICTs, videogames and learning. Section 4 will discuss about our target audience and the importance to bring the theme of Brazilian folklore to them, while Section 5 will discuss how the concepts shown on the previous sections were put together in the development of the game, focusing on its first level as a clearer example. Section 6 will also present our methods for evaluations and our findings from our first contact with the students. At last, Section 7 will present our final conclusions and Section 8 our acknowledgements.

2. MOTIVATION VS LEARNING

As we stated in the previous section, the matter of teachers' complains about their students' lack of motivation in classrooms was the first step in bringing this work together.

When studying about the ways in which motivation may affect learning, we took notice of how often it was to find in literature author's statements regarding teachers' complaints about the lack of motivation of their students or even transcribed excerpts of this type of complaint.

In truth, the matter has been boosted to one of the most tackled within researches dealing with learning and motivation during the last decades, with researches being conducted under the most varying points of view and assumptions, such as the works of Boruchovitch et al. [4], Bzuneck [6], Steinmayr and Spinath [36] and Schunk, Prinrich and Meece [35]. Interestingly enough, in spite of their own particular perspectives about the matter, all consulted authors agree on the pivotal role played by motivation on learning processes, as it directly affects one's desires and wishes in unique ways.

That last statement unwillingly highlights a very important aspect of the study of motivation: there is no single definition for the concept of motivation or neither a complete list of all the existing factors that might have influence on one's motivation. A reasonable account since each person has his/hers own set of factors that establish how they best learn or what can interfere with this process [17].

The inexistence of a complete list of factors that affects one's motivation is not to say that there are no accounts of them at all. Each different study about motivation will present its own compilation of factors that might account for better or lack of motivation in respect to the scope of the research. This makes possible to highlight those of higher frequency. From these, we will delve on two of them: the teaching of subjects far removed from the daily lives of the students and the gap between the more traditional lecture/test teaching model that is still strong in most schools and the new needs of the students due to the rise of ICTs.

More precisely, as most schools have misused time in adapting to more dynamic teaching methods that would better reflect the current paradigm of our society these institutions keep favoring a lecture/test model of teaching, which focus on the transmission of knowledge to static students [13][5]. However, this model grants these learners with few opportunities to interpret and analyze the problems placed before them, in addition to, as of today, be in stark contrast with our society's current paradigm [10][5][10]. A paradigm known as Information Society (IS) that is marked by the intense and interchangeable interaction with the ICTs and by the ever expanding flux of information they provide, which virtually demolishes geographical barriers of time and space [10].

Adding to that matter, when reaching their final mandatory years of education, students of Brazilian schools have been known to be tutored almost exclusively to succeed to ingress on higher level education and labor market. This leads schools to abstain themselves of better diversified curriculums and to the limitation of career paths students may follow in their future [39][29].

A first gateway to change that may have come from the set of mandatory curricular topics established by the Brazilian government in 2011. Such topics do not need to be taught strictly as disciplines and include themes such as the culture and history of African-Brazilian and Indigenous people [29]. Two topics that make for a great deal of the pillars of the mythology of Brazilian folklore as is show by the works of Cascudo [9] and that, in turn, assure a room for the theme of our game within classrooms.

3. ICTS, VIDEOGAMES AND LEARNING

ICTs are a part of our lives today. Constantly, we share our space with computers, smartphones, videogames and tons of other technological devices meant for the most varying purposes. They enable our society to work today in such ways that we have

largely become dependent of these technologies. They have also been eagerly accepted by the younger generations who embraced their capability to provide virtual environments vastly rich on information and on its sources [28].

Such environments demand from their users the employment of inductive reasoning in order to gather information. At the same time, they provide them with immediate opportunities to put this information to practice and transform it to knowledge. Traits that can be argued to be at the very core of videogames and that can be further enhanced by the often reward of the users' efforts and successes [31][37].

In addition, countless combinations of virtual worlds and situations can be designed within videogames, making them more than capable to attract the attention and commitment of learners by providing them opportunities to get in contact and experience with all different sorts of subjects and tasks [37].

This not only assures videogames a place in education as it also makes possible for us to develop a game dealing with Brazilian folklore. A prospect that was met with enthusiasm by the teachers of our target audience, who pointed that this meets the interest of their students by bringing closer to classrooms an ICT common to their daily lives. In turn, this gives the students something familiar and that they can relate to, feeding their motivation and enhancing their desire to persevere and succeed in the tasks provided to them, while granting them with a sense of direction and purpose that is highly desired in learners [37].

3.1 Learning through videogames

Educational videogames are not a new type of media or concept. Today, one might find a fair variety of games with this kind of purpose under different labels, such as Serious Games or Digital Game Based Learning (DBGL). At the core, all intend to use the environment and interactivity provided by videogames as means to disclose information, simulate situations or assist the practice of skills [12][1][37].

There are several examples of such games concerning varying areas of knowledge, such as medicine, engineering, rescue training and military. An interesting older example of this is a PlayStation 1 game from them 1990's focused on reinforcing students' learning [31]. The idea was simple, if a game is 50% instructional and 50% fun, playing it for at least 06 hours during weekends would add 03 hours of instruction to these learners. A concept put to test in over 400 school districts in USA and found out a 25% increase on the linguistic capabilities on the students' who played the game against those who did not, and an additional 50% increase on their skills for solving mathematical problems [31].

Such approach appeals to the idea of making educational games as much enjoyable as entertainment games, in order to ensure that students will in fact choose to play them. A similar background is taken by Click Health, responsible for making games to aid kids with health problems such as diabetes or asthma that, through rigorous clinic testing, found out a 77% drop on the number of medical visits and emergency rooms' hospitalizations on the group of players in contrast with their control groups [31].

However, few organizations have made more extensive use of educational games than the United States Army. One of the true pioneers on the use of these media, the army has employed both regular commercial games, to teach youths the basic principles

and concepts they need to know before training in expensive simulators, as well as developing and largely distributing games of their own, which are made available at regular stores and that are part of their training program [31]. Games such as America's Army: Proving Grounds released at 2013 as part of US Army's recruiting program.

In spite of being viewed with some stigma by some educators [37], videogames are in fact able to achieve a series of instructional feats, due to their ability to create a space for immersive mentoring that results from the combination of different sets of digital learning practices into an attractive interface that students can explore and tinker with in order to gradually progress over time [24].

That way, learning is a natural consequence of experimentation, which in turn might result in knowledge. Such view meets the definition of Kolb [22] and Kolb and Kolb [23] Experiential Learning Theory – ELT, a theory that supports that learning is a process that consists of one's own lived experience and of its shaping into knowledge in response to data gathered from the experience and to its connection to one's previous experiences.

The theory is so well linked to the way learning occurs in videogames that 2010's editor of the journal Simulation & gaming 2010 D. Crookall has gone as far as stat that it defines the foundation of best practices for players to succeed in such environments [12].

This is because ELT not only defines learning in regards to experimentation but also as a cyclic and non-stopping process in which the learner (or, in this case, the player) is continuously building knowledge through the gather and transformation of data from lived experiences. This is just another way to say that one is constantly creating, testing and reformulating hypothesis until he or she can find a solution to the task at hand.

Figure 1 depicts this cycle and its formal division into the grasping of the experience, further divided into the concrete experimentation and the abstract conceptualization; and the transformation of experience, consisting on the active experimentation and the reflective observation.

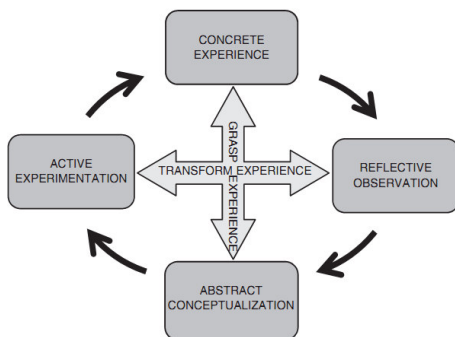


Figure 1 ELT cycle. Source: Kolb e Kolb [23].

As the name suggests the grasping of the experience deals with one's acquisition and comprehension of the experience. It occurs through the so called **concrete experimentation**, in which one deals with the perceivable aspects of the real or virtual world one is immersed in and that can be felt through the use of the five senses. This is complemented by the **abstract conceptualization** that regards the interpretation of this reality by means of reasoning, analysis, or systematic planning.

Meanwhile, the transformation of the experience concerns how one shapes and connects what has been experimented with what he or she knows. In this, the **reflective observation** concerns one's ability to observe an experimentation being performed by another, and to reflect upon what has been seen in order to understand it. The **active experimentation** goes the other way around that as it relies on one's execution of the task by him/herself as a way to understand the experience and its results.

As ELT is based on experimentation it takes benefit from the strong sense of immersion found in videogames, which has a large share of responsibility for the success of the ELT among the media, as the theory needs a "reality" in which learners can experiment on. The concept of immersion also accounts for a large share of the maintenance of one's attention and interest to the task at hand, thus contributing to the enhancement of one's motivation, as it pushes them towards interacting with the game environment and solve the tasks placed before them in order to advance and explore that environment even further [24][12][1].

3.2 Imbuing motivation in videogames

In the last paragraph of the previous section we brought up a series of traits that are connected to the field of Affective Computation [33][14], which is a result of our attempts to build an environment that is meant to act as a learning object to motivate students to interact with it and learn from such interaction.

Such goal was established due to the very positive effects that motivation has in learning. Students who are properly motivated for a task place more dedication on it and might even engage it for pure joy instead of a feeling of obligation. On the other hand, the lack of motivation can instill severe complications to the learning of students, hindering their desires to employ any effort to their tasks.

This is a matter of concern due to the fact that a student is essentially an agent that performs tasks, most of which have a cognitive nature and are meant to highlight the student's competencies such as attention; concentration; processing, development and integration of information; reasoning and problem solving [33].

Consequently, motivation has power to affect students by promoting their proactive and self-engagement to classroom tasks and to the learning process as a whole, prompting them to choose their own courses of action and put them in practice in order to fulfill such tasks and, therefore, their own needs [5]. Severe lack of motivation in students can in extreme cases lead to likewise intense consequences, such as deprive them to place any effort to take part on the learning process, decline going to classes or even school evasion. Hence, it is important that schools seek to improve the motivation to learn in all their students and that they aid those with problems of this nature to overcome them [5].

In understanding that, we looked for ways to enhance students' motivation within our game due to its purpose of acting as a learning object for a particular teaching topic. An approach that targets to make such game an enjoyable experience that can lead students to learn about its theme, instead of be labelled by them as, yet, another "boring" educative game.

Hence, the development stages of the game have been underlined by a series of concepts and guidelines when electing its design, challenges, game plot, dialogs and characters' appearance that

focus on keeping the game as a whole interesting to players, maintaining their attention and level of fun in order to make them absorb the subject barely even noticing.

The first of these are Malone [26] and Malone and Lepper [27] heuristics for the design of motivational games. In spite of being conceived during the 80's these guidelines are still largely used today in reason of their commitment to imbue motivation in videogames by balancing their levels of Challenge, Fantasy, Curiosity and Control in respect to their target audience.

While the ELT [22][23] will provide students a practical learning environment, the guidelines [26][27] will be tasked to make it a pleasant experience, something that we felt the need to verify if would be in fact achieved, but that the guidelines themselves provided no means to. To be able to do so, we resort to Keller [20][21]'s ARCS motivational design model.

The model that takes its name from the initials of the four components it consists of: Attention, Relevance, Confidence and Satisfaction; is tied by us to Malone [26] and Malone and Lepper [27] in order to check if we were able to make an environment that motivates students.

Within our understanding, ARCS' **Attention**, i.e. the easiness of players' engagement and response to the game environment is closely related to the guideline of Challenge as it gives shape to the teachings subjects of the environment and stimulates students to reflect upon them. It also has some attachment to Fantasy as both it and Attention benefit from imagination.

Relevance, which aids players to link new information to what they already know, also takes benefit in Challenge as it forces players to reflect upon what they are experiencing. However it has even stronger ties to Curiosity as it is what makes players wonder and experiment with the game mechanics and plot.

Confidence and its role of nourishing students with good expectations of performance appears equally related to Curiosity, which will build up on players' expectations; Challenge, which will set what the players' believe they can accomplish with their skills; and Control, which will set a limit to the number of attainable action that players might choose from and to the interferences that might fall upon them.

Satisfaction results from students putting in practice what they have just learned. While a more traditional teaching setting might restrict satisfaction to the late stages of the learning process, a game environment allows Satisfaction to occur simultaneously to players' progress on it, with emphasis on moments such as the solving of a particular hard puzzle or level advance. Satisfaction seems better linked to the guideline of Control due to the limitations it places on the number of viable solutions for the game's tasks and to the guideline of Fantasy, which gives meaning to these tasks. Moreover, the use of external motivators, such as rewards and other positive feedbacks [32] can also play a role on Satisfaction as they act as praise to the players' efforts (Challenge).

3.3 Games with similar backgrounds

Videogames that portray elements of Brazilian folklore are somewhat a recent phenomenon. Such games do not necessarily take a turn towards serious games, but simply take advantage of the fantastic settings of these legends to create an attractive game environment with elements that are not commonly seen.

Nevertheless, such initiatives are taken by groups of Brazilian game developers who, though not in contact with each other, share the idea to bring a new perspective to these myths and disclose them to a public that, otherwise, might even ever come to know them.

Among such games we can name a few, like Aritana and the Harpy's Feather, a game released on the second semester of 2014 for the Steam¹ game distribution platform [16]. In it, the player controls an Indian named Aritana who must face challenges and characters connected to Native-Brazilian folklore such as the Mapinguari, a carnivorous gigantic manlike creature, covered in fur and with a distinct bad smell and a huge mouth on its belly.

Along the game, the player is faced with creatures such as the above and other elements of Brazilian folklore and culture (such as replacing game coins by seeds of guarana) while trying the retrieve the harpy's feather of the game title, the last ingredient needed to make a potion to save the life of the leader of Aritana's tribe [16].

A similar approach is found on the in-development game Folklore Warriors (*Guerreiros Folclóricos*) from Unique Entretenimento Digital [19], which makes use of the characters of Brazilian folklore due to the fantastical potential they display as game characters instead of any particular teaching goals. General aspects of the game plot involve it being set in another world that is home to these characters, like in our own game, and placing the Saci as the main villain who controls a horde of zombielike creatures known as Dried-bodies (Corpos-Secos). The game seems to be yet on its character development stages and most of its game plot and mechanics remains open [19], yet its game plot and election of characters seems, thus far, to be the one closest to our own work for this research, which, can be found in Carvalho, Barone and Bercht [7] and [8].

While these games have no distinct educational approach this is not the case of the game Xilo, a currently in-development game of the Kaipora Digital game house that focus on characters of Brazilian folklore that are mainly common to the northeast part of the country [38].

More than an entertainment purpose, Xilo has the goal to present the culture of this part of Brazil to a broader audience, enhancing their knowledge about this subject and thus, fits our discussion of Serious Games and DGBL at the start of section 3.1. The game's visual identity also suits its setting, as the main character Biliu is duly fitted with the clothes of Cangaço as he explores the game world, collects different xylographs along his way (hence, the name of the game and its art style) and meets the Saci and a number of other characters of Brazilian folklore [38].

In common with Xilo our own game, Folclórica, also aims to make its theme know to a broader audience, but has a completely different feel to it in what concerns, graphics, mechanics and game plot, as we will be detailing next.

4. TARGET AUDIENCE AND RELEVANCE OF THE GAME'S SUBJECT

The game we are developing to teach students about the myths of Brazilian Folklore is called "Folclórica" and consists of a 2D

¹ For more information see <http://store.steampowered.com/>.

single player platform²/puzzle³ game. The game is initially being developed consisting of three levels representing three of the five geographic regions of the country. There are plans to add the two remaining regions as game levels in the future

When this proposal was first discussed with teachers of the students selected as target audience they were enthusiastic about the idea, due to, in their own accord, they seeing the teaching of national myths in schools as a matter that contributes to one's valuing of the Brazilian culture. Especially when the students display a clear deal more of knowledge and care for myths and legends of other cultures than of their own.

In fact, something that has called our attention when discussing the selection of this subject with teachers from our target audience is that, according to them, there is a lacking of material about this subject, be it books, videos or any form of media. A fact that makes the choice to develop a game that deals with this subject all the more interesting as it adds to the appreciation of the cultural diversity of our society.

As for the students taking part in the research, the target audience consists of two classes of the last year of primary teaching from the Colégio de Aplicação of the Federal University of Rio Grande do Sul ranging in age from 13 to 15 years old. One of the classes will assume the role of control group and the other the role of case study group. All students taking part in the research have consented to do so and signed papers in accordance to the requirements of the Ethics Committee overseeing their institution. These documents were also signed by their parents or legal guardians.

Within those classes, Folclórica will be used as part of the subjects of Literature of the Portuguese Language discipline. A befitting election of discipline to conduct such research as Fernandes [15] reminds us that the discipline of Portuguese Language and Literature must aim to achieve equity, aiding in the prevention of racism and intolerance by meeting the Curriculum Guidelines for the Education of Racial-Ethnic Relations, which seeks the recognition and value of the identity, history, culture and equal appreciation of the different roots of Brazilian culture, such as the African, Indigenous, European and Asian [15][2].

In that sense, by discussing these myths in classrooms we are not just ensuring their stories to be known, which is in itself very important as they are a part of our culture that is often neglected, but we are also setting a viable way to challenge prejudices and a series of stereotypical representations [25].

Moreover, doing so potentially aids the rescue and enhancing of self-esteem of these cultures, especially the African and Indigenous ones, which have a much diminished space in classes in comparison to the European culture, which is made aware to students not only through history books and lessons as well as several activities connected to the reading of classical or contemporary stories [25][15]. Different to Brazilian folklore such

materials are found in abundance and are easily accessible through fairytales, Greek myths and many others.

Perhaps one of the reasons that makes such materials preferred by teachers is that there is no risk in incurring in the anger of parents or other educators, as the religious aspects they deal with are no longer in practice by any current civilization. In what regards the contemporary society they are myths, which is not the case should a teacher approach some aspects of Brazilian culture of African, Indigenous or even European roots [15].

In any case, such discussions do have merit. By knowing such cultures students can reflect on their stories and characteristics, establishing connections with different aspects of our society, such as current habits, vocabularies or celebrations and in that, understand how they are connected with themselves and their lives, giving them a sense of being in some way a part of it [15].

5. THE GAME

As stated on the previous section, Folclórica is a 2D single player platform/puzzle game whose levels draws strong inspiration from real geographic levels of Brazil and places the student in contact with different myths of Brazilian culture while he or she explores its environment. The game was developed using the Unity 3D Game Engine⁴ and the C# programming language.

The first concept to this game was shown in Carvalho, Barone and Bercht [7] and was further developed in Carvalho, Barone and Bercht [8], with this paper being thus another step towards the conclusion of this research. In that sense, in order to understand how the environment we created can impact on learners' performance and motivation it is necessary to comprehend how the concepts shown in Section 3 fit within the development process our game, which is precisely what we discuss next.

5.1 The game plot

The main character of our game is a kid, whose gender will be chosen by the player and who will have a sibling of the opposite gender. The game's opening, presents the kid playing a game on his smartphone while going back home with his sibling. The kid's game figures mythical characters of other cultures, whose characteristics and abilities are praised by him.

Meanwhile, he is constantly being interrupted by newsfeeds of strange disappearances and other occurrences in Brazil, which different bystanders claim to be the work of different creatures of Brazilian's folklore. With most of the said names unknown to the kid he complains that it would be more interesting if that was in fact the work of some of the foreign myths of his game.

In a moment of distraction his sibling is taken away by the Cuca, who was looking for the Saci but when seeing the sibling and believing her as an easy target decided to take her instead. This fact the kid learns from the Saci as he found his hat on the floor and, by taking it, gains the word of the Saci that he will help him find his sibling as much as he can as long as he have his hat returned.

These two mythical characters are two of the best well-known characters of Brazilian folklore, with their names being known even by Brazilians who are not familiar to their stories. Hence,

² Platform games are the ones in which the player must jump through different types and levels of platforms in order to advance within the game.

³ Puzzles games are grounded on the solving of logical challenges or riddles that must be solved so one can advance through the game.

⁴ For more information see <http://unity3d.com/>.

they will have a prominent recurring role along the game plot, acting, respectively, as the main antagonist and a supporting character that provides the player with information about the game setting, controls or mechanics.

Following this introduction, the Saci will give the kid a small card containing his basic information. Throughout the game, the kid will collect similar info regarding the other myths featured in “Folclórica”, while having such information delivered to him also through the plot.

One of such instances happens immediately after this, as the kid is taken to a parallel world where the myths live and is introduced to the Boitatá who is distressed cause his many fiery eyes have been loosed on the land and the Shepherding little black boy who has been trying to calm him down and help him to look for them. Through such passage the player learns from the myths themselves who they are and what is their role and tales and some of what is coming to pass in this world, which, as it is connected to Brazil’s lands and history, also has influence on it.

The Cuca has been infuriated to have been forgotten by Brazilians and reduced to a fairy tale and has begun to take action to prove herself not only very real but also very powerful and dangerous, resorting to series of different means to do so. Confronting the Boitatá and scattering its eyes so it could set places aflame was one of her deeds, as well as the newsfeeds of strange occurrences over the country that the kid was reading on his smartphone at the beginning of the game.

The Shepherding little black boy has the ability to find that what was lost, thus the kid agrees in helping them so that the Shepard will help him find his sibling and for fear that she might get trapped on a fire. And so the kid starts his journey to find the Cuca and to get his sibling back; a journey that at the same time, introduces him to characters of the Brazilian folklore and their tales.

5.2 Characters and graphics

When considering the age range of the target audience and the fact that Folclórica is conceived as a 2D platform game, we decided by a mostly vivid and vibrant setting inspired by the classic platform games of the 90’s as well as of more recent games that seem to capture that feeling, like Number Nine, Inc.’s 2008 game Braid. A screen capture of Folclórica’s first level, inspired by Braid and games alike, is shown on Figure 2.

Meanwhile, the player’s avatar, which will account for some amount of customization, will draw inspiration mainly from Nintendo’s A Boy and His Blob, which we believe draws a close resemblance to a school kid and might aid students to identify themselves with it. Folclórica player’s avatar is seen in Figure 3.



Figure 2 Screen capture of Folclórica’s 1st level. Source: screen capture made by the authors.

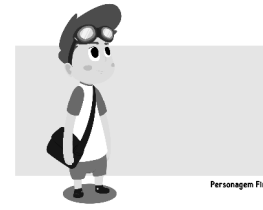


Figure 3 Male version of player’s avatar. Art: Patrick Pereira.

Mythical game characters were chosen based on the game plot and on their connections with the region of Brazil depicted by the game level they appear on. Each myth shown in the game has its background story explained to players through the plot and a more detailed description that they can access in-game any time through a specific characters’ menu.

Among the different materials we consulted to craft the background for the mythical characters of the game, the most valuable one was the work of Cascudo [9], author whose many works (some dating back to more than 70 years ago) are to this day among the most important collections regarding Brazil’s culture and folklore. In respect to such characters, for the first level of our game, these are:

- Black face Ox: the Ox is, essentially, an amalgam from different versions of the Bumba-meu-boi. All versions of the tale talk about an ox killed by a slave to give its tongue as food for his pregnant wife and later resurrect by indigenous shamans, which resulted in a great party throw by the slave’s master. His tale bears yet elements of accounts of an accursed ox that always looked to be angry. His figure is mostly know to Brazilian’s through the child’s lullaby that, in a free translation, goes like “Ox, ox, ox, black face ox, take this kid who is scared of grimaces”. In-game, the ox will be roaming aimless, driven by his angry. Besides the first level, he will be featured in different parts of the game as a mix of damage dealer and moving platform.
- Carbuncle: there are several Carbuncles in literature all of which are some sort of animal, like cats or more commonly lizards, which have a gem over their head able to grant wishes. Some accounts say they have a pact with the devil and turn to beautiful women at night. Others, that they willing give their gem to humble and good-hearted people. By capturing a Carbuncle and acquiring its gem one can be granted a wish, usually connected to some kind of wealth. In Folclórica a Carbuncle appears as a shy but helpful Non-Player Character (NPC) that provides its gem to the player after he has been freed.
- The Charmed Ones: three beautiful sea nymphs that inhabit an island in the south part of Brazil attracting men and sinking ships with their sing. According to legend, they halted this practice after one of them fell in love with a sailor and took him and her sisters to under the sea. One of these nymphs will get trapped among the fiery eyes of the Boitatá use her voice to try to lure the player to free her.
- Curupira wild boars: the Curupira is a red-head dwarf whose feet are turned backwards to avoid having his

tracks being followed. A fierce protector of the woods, he commands a herd of wild boars always riding the biggest of them. In-game, his command over the herd was broken and now the creatures run wild and mad across the lands, causing all sorts of trouble and posing significant danger to who comes too close to them.

- **Shepherding little black boy:** a nameless slave boy of a mean rancher who had the Virgin Mary for his godmother. Twice the boy had lost the rancher's herd after falling asleep, exhausted from the beatings he received. As punishment, the rancher let him to die, naked on the top of an anthill. Later the rancher returned to see if the ants had done his deed and found the boy with no marks on his skin, standing near the anthill with the Virgin Mary near. The virgin claimed the boy was no longer part of this world, yet men were said to see him at night, leading a herd on horseback as he searched for whatever people had lost, as long as they lit a candle for him that he could take to his godmother's altar. In-game the Shepherding will be seen calming the Boitatá and telling the player of his candles that can be used to look for the scattered eyes.
- **Boitatá:** a giant snake, survivor of an inundation that killed a huge number of animals. The snake ate their eyes and became as bright as fire, powered by the last sun they had seen in life. The origin of the legend can be tracked to the Will-o'-the-wisp phenomenon. In-game, the Cuca was responsible for taking the eyes of the Boitatá and scattered them, causing fires that will affect both the world of the myths and of men (Brazil). The player must gather them back in order to avoid fires, helping the serpent and (maybe) his sibling.

With the exception of the Black face Ox all the myths selected for the first level have very strong ties to the south region of Brazil depicted by it. However, all over Brazil people are at least acquainted with the Black face Ox myth through its lullaby, which strength's its role as a recurring character throughout the game. Nevertheless, Folclórica has two main recurring mythical characters with much a bigger role to play.

- **Cuca:** one of the main mythical characters of Brazilian folklore, known for its lullaby that hastens children to sleep or else they will be taken by her. In myth, the Cuca is an evil witch, first depicted as an ugly old woman and later as an anthropomorphic alligator that steals and eats disobedient little children, a tale with origins in Portuguese dragon legends. The Cuca will be the game's main antagonist, angry for Brazilians having turned her into no more than a fairy tale villain. Evil she might be, but not a fairy tale. She intends to prove how real, powerful and dangerous she can be when enraged.
- **Saci:** another of the main mythical characters of Brazilian folklore, the Saci is a mischievous boy. He is not evil though; his tricks have no meaning to harm people, mostly causing annoying situations that are fun to watch for the ones not involved in it. He is generally described as a one legged black boy smoking a pipe and wearing a red hat, which gives him his powers. Taking his hat off and trapping him in a bottle is the only way to stop him. He travels the land on whirlwinds and, if in a good mood, may help people to look for lost things.

In-game, the Saci has evaded the Cuca and stumbled on the player, eventually agreeing to help him look for his sibling, acting as a support NPC. Most notably rescuing the player in his whirlwind whenever he is about to "die".

5.3 Connections to learning and motivation

We started section 3.2 by first highlighting the importance of motivation for the learning process of students and the importance that should be placed by schools in looking for ways to improve motivation in their students due to the extreme consequences that the lack of motivation might lead to.

That is to say that it is possible to enhance students' motivation. Often, the motivation for learning of each student results from the convergence of one's traits with factors acting mainly over the classroom setting. Once this combination is processed by students, the result may be a weak or distorted motivation, which can be enhanced and optimized [5][3].

This is possible because every student has his or hers own set of beliefs regarding what they are learning and what they believe they might accomplish. Beliefs that they value in answer to their individual interest on the task and the meaning they see in it [30][5]. In other words it is possible to interfere in students' motivation, with positive or negative effects, by interfering on one's belief that he or she can accomplish the task and giving a significant meaning to why they should do so.

It is for this reason that we chose to tackle the lack of motivation by focusing to bring the subject closer to their daily lives, choosing a medium that is fairly common to the students outside the boundaries of the school. Simultaneously bringing the subject of the myths of Brazilian folklore closer to the reality of these students and diminishing the gap between the teaching practice of schools and the context of IS they are so used to.

Additionally, by choosing to create a game that deals with the myths of Brazilian folklore brings yet another benefit directly tied to Malone [26] and Malone and Lepper [27] guidelines, the concept of Fantasy.

Like the above authors state in their works, Fantasy represents the use of imagination to create circumstances uncommon to the daily life of students. Using of attractive game elements such as settings, characters and plot to instill emotional and affective appeal to players, hence engaging them in the shown tasks and nourishing their interest by these situations.

As it stands, Brazilian folklore vastly excels in this respect, having no lack of fantastic themes and characters that take place in a wide range of locations and that can be adapted to game settings. We favor such potential in conjunction with game challenges that we strive to balance in order to appeal to the Attention [20][21] of most players, believing that either too easy or too hard challenges are likely to ward players.

As Fantasy [26][27] also underlies the game plot, we seek to translate the legends shown thus far to our game environment by connecting them and creating a meaningful story from those myths most cited traits and their better known places of appearance, thus, inciting the Curiosity [26][27] of players.

This way, we link our game plot to the concept of Relevance [20][21] as it is Curiosity that drives players to explore the game environment and experiment with it, leading them to ponder the

gathered information and shape it in a way that it connects with what they already know; in other words, learning from this environment and their experimentation with it [22][23]. Additionally, as we have stated before, this experimentation will also have influence on their Confidence [20][21].

More precisely, while players' Curiosity pushes them to experiment with the environment and to formulate and test hypotheses in order to find a solution for the tasks they are faced with, their Confidence will be strengthened or weakened in response to their belief of if and how they can solve such tasks. Thus, being directly linked to the Control [26][27] that the game offers to players. Players' Confidence is also subjected to their Curiosity as it will prompt them to explore and interact with the game environment and, in time, reveal to players' what the game allows them to do, what it does not and what can interfere with their actions.

Lastly, they will feel Satisfaction [20][21] from progressing over the game's settings and plot, which is to say, from being able to grasp and use the game mechanics to solve the challenges they have pondered on and move forward on the game settings. Hence, being the result of the successful combination of all the previous forms of interaction we listed in this section. Being yet somewhat enhanced by the players' game score. However, Satisfaction should not be the only result of this combination.

Learning will result of it as well, being the outcome of the player internalizing all the experiences he lived in-game through his avatar, experiences that are in accordance to what is stated by the Experiential Learning Theory (ELT) [22][23] and that will force him to reflect and try to understand and cope to what was presented to him.

Through the plot, we will put the player in contact with different myths such as the ones listed on the previous section and show to him/her many of their traits. An approach that starts with the plot setting the player in a world where he will have a sibling kidnaped by the Cuca that is in need of rescue.

In due time, throughout the opening sequence and the end of the first level, the player will also come to meet the Saci and get his collaboration in rescuing his sibling; will learn of the Boitatá's, Shepherding's and Carbuncle's abilities by themselves and come himself to have some sort of access to them; and will have to deal with the trickery of the singing of a Charmed One, a sea nymph whose voice can attract men to their doom (see section 5.2).

Other than that, the players will also have access to more details about the characters they encounter by collecting notes scattered through the game settings that contain more precise information about these myths based on their real world counterparts and how this is shown in-game. Once collected, this information will become accessible to players whenever they see fit to consult it, which can be done through a "Characters" tab on the game's Pause menu. Screenshots of this tab are depicted in Figure 4, Figure 5 and Figure 6.

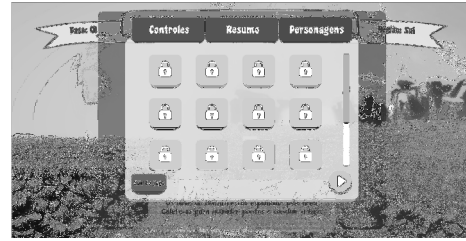


Figure 4 Characters tab on the Pause menu with no information available to players. Source: screen capture made by the authors.

In effect, the game's plot is our main device to teach players about the role each of these myths plays in Brazilian folklore and that represents a part of our culture that is not given its due weight and that seems to be neglected to an unimportant position in favor of similar tales and aspects of foreign cultures.

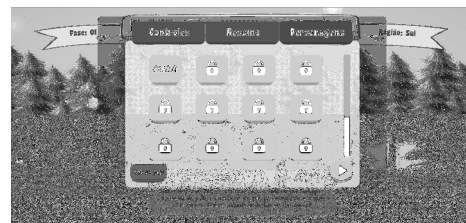


Figure 5 Characters tab on the Pause menu with information about the Cuca available to players. Source: screen capture made by the authors.

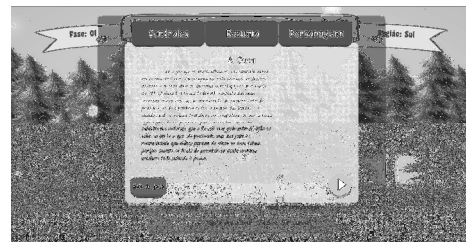


Figure 6 Information about the Cuca being displayed to players on the Characters tab of the Pause menu. Source: screen capture made by the authors.

6. EVALUATION AND CURRENT FINDINGS

For the game's evaluation we will be using both the case control class and the case study class. This will be done in the following way.

The control group class will be subjected to their regular classes with the teacher, which will consist in lectures about the Brazilian folklore. For the first testing, such lectures will focus on the same characters shown on the first level of Folclórica and the tales commonly associated to them in Brazilian folklore.

The plan accorded with the groups' teacher is that the lectures will take one week of their class' schedule, during which the control group class will be exposed to this subject, interact with the game and be evaluated by their teacher by means of an exam.

The interest here is to have a baseline group to use as standard in order to verify the performance of students who had the subject taught to them with the support of lectures, group tasks and tests in conjunction with the game, so as to identify their impressions

regarding regular classes and the extra depth the game provides about the subject by expanding their experiences with Brazilian mythology.

By doing that, we let the students “live” as part of the context of Brazilian folklore, through their perception of the characters’ actions, behaviors and personalities, hence, bringing those myths closer to the students’ reality.

This will allow us to gather and compare data from students who were taught the subject with the support of a more classic teaching-learning experience to those who will use Folclórica exclusively as a learning tool. Through such comparison we intend to take notice of these students perspective about how would they prefer to learn, which of these ways they believe to be more effective and which of them has a bigger impact on them.

In order for such comparison to take place the case study class will also have to be subjected to a test created by their teacher. However, the learning experience they will be subjected to will differ from the first experience of the case control class.

The reason for that is that the first in-class contact of these students with the subject will happen straight through the game. While moving on the game environment, students will go through the experiences we described in section 5.3 and learn about those characters through those experimentations and the reflections they imbued on them, which, as we stated before, is in accordance with the foundations of the ELT [22][23] shown along section 3.1.

Due to our belief that, in order to promote learning the game must be able to affect students motivation we also instilled in our game the motivational guidelines and concepts seen in section 3.2, which we connected to our game through the statements of section 5.3. However, in the same way that we must verify if there was any improvement or decrease in students’ performance through the use of our game, such difference should be viewed taking into account if our game was able or not to imbue any motivation in students.

To this end, we resource to the Instructional Materials Motivational Survey (IMMS), Keller’s [20][21] own tool for asserting motivation in learning materials using is ARCS model that consists of a 36 items questionnaire aiming to measure motivation in an instruction material through the components of the model.

Hence, our comparison will consist on a qualitative and quantitative analysis. The quantitative analysis will consist on the comparison of the grades of the exam subjected to both the control and case study groups, while the qualitative aspect will consist of the application of the IMMS questionnaire and an open dialogue that will be conducted with both groups once they have played Folclórica.

In that respect, the questionnaire will have its items answered by students that have concluded the first level of the game as an online form. The data collected from it will not only serve to verify if the game was able or not to deliver motivation to students, as it will also be a tool for future improvements of the game and its next levels, as the authors and developers will know directly through their target audience which aspects they should attend to improve.

Here, we use the version of IMMS questionnaire adapted for educational videogames found in Huang et al [18], which we

show in Table 1. Only its first two columns will be seen by students, who will attribute to each item a grade ranging from 1 (absolutely false) to 9 (absolutely true).

Table 1 IMMS questionnaire for educational videogames. Source: Huang et al [18].

No	Item	Component
1	When I first looked at the game, I had the impression that it would be easy for me.	Confidence
2	There was something interesting at the beginning of the game that got my attention.	Attention
3	The game was more difficult to understand than I would like for it to be.	Confidence
4	After reading the introductory information, I felt confident that I knew what I was supposed to learn from the game.	Confidence
5	Completing the exercises in the game gave me a satisfying feeling of accomplishment.	Satisfaction
6	It is clear to me how the content of the game is related to things I already know.	Relevance
7	The game had so much information that it was hard to pick out and remember the important points.	Confidence
8	The interface design of the game is eye-catching.	Attention
9	There were examples that showed me how the game could be important to some people in the learning setting.	Relevance
10	Completing activities in the game successfully was important to me.	Relevance
11	The quality of the writing in the game helped to hold my attention.	Attention
12	The content of the game is so abstract that it was hard to keep my attention on it.	Attention
13	As I worked on the game, I was confident that I could learn the content.	Confidence
14	I enjoyed the game so much that I would like to know more about this topic.	Satisfaction
15	The design of the game looks dry and unappealing.	Attention
16	The content of the game is relevant to my interests.	Relevance
17	The way the information is arranged in the game helped keep my attention.	Attention
18	There are explanations or examples of how people use the knowledge in the game.	Relevance
19	The activities in the game were too difficult.	Confidence
20	The game has things that stimulated my curiosity.	Attention
21	I really enjoyed learning with the game.	Satisfaction
22	The amount of repetition in the game caused me to get bored sometimes.	Attention
23	The content and style of writing in the game convey the impression that its content is worth knowing.	Relevance
24	I learned some things that were surprising or unexpected with the game.	Attention
25	After working on the game for a while, I was confident that I would be able to pass a test on the content.	Confidence
26	The game was not relevant to my needs because I already knew most of it.	Relevance
27	The wording of feedback after the exercises, or of other comments in the game, helped me feel rewarded for my effort.	Satisfaction
28	The variety of reading passages, activities, illustrations, etc., helped keep my attention on the game.	Attention
29	The style of writing in the game is boring.	Attention
30	I could relate the content of the game to things I	Relevance

No	Item	Component
	have seen, done or thought about in my own life.	
31	There are so many words on each game screen/page that it is irritating.	Attention
32	If felt good to successfully complete the game.	Satisfaction
33	The content in the game will be useful to me.	Relevance
34	I could not really understand quite a bit of the material in the game.	Confidence
35	The good organization of the content in the game helped me be confident that I would learn this material.	Confidence
36	It was a pleasure to work on such a well-designed game.	Satisfaction

6.1 Students' first impressions

In spite of the first testing of the game being currently under schedule we have already met the students from both the case control and the case study classes. The first encounter has occurred on the first semester of 2015.

At the occasion, it became clear that many of the students held mistrust for educational games based on their own previous experiences with these media and see them as "boring" due to their poor construction, emphasis on heavy in-game reading material and virtual lack of care on keeping a level of fun to the gaming experience.

Just alike, many of them had the wrong idea that commercial games cannot (or do not) teach them anything, which is far from true, with known more instances of the matter including the Ubisoft's Assassin's Creed game series and the strong factual historical background that underlies its plot and Microsoft's older Age of Empires series, which heavily relies on a proper management of resources in order to succeed.

As expected due to the accounts of the teachers, it was possible to observe a clear wider knowledge among students about foreigner myths in contrast to national ones. Characters like Thor, Odin, Zeus and Anubis number just a few names cited by students with whom they had contact through different sorts of entertainment material, such as books, movies and videogames.

A recurring game named by the students was Smite, a Multiplayer Online Battle Arena (MOBA) game released last year by Hi-Rez Studios in which players gather in groups to face each other, each of them controlling an avatar representing a deity or hero of cultures like Egyptian, Greek, Norse, Chinese and others.

This was an interesting note from students as it allowed us to draw a quick first comparison with their current knowledge of similar such characters on Brazilian folklore and mythology. Accounting for the number of creatures, deities and their respective backgrounds that could be named by students only a few of those were Brazilian ones.

Even so, Brazilian myths named by students on the occasion were given little background, with just their names being known by them in almost every case; names that included the Saci, the Headless-Mule, the Curupira and the Iara. In that sense, we see our work as a contribution and, above all, an effort of appreciation of the Brazilian culture that looks forward to set itself apart from a though often observed within Brazilian society in its most diverse aspects that "foreign is better".

In addition, the fact that their opinion about the game will be taken into account in order to improve it has made the students extremely interested about the game and its development, having in several occasions asked their teacher about its current state of development and schedule of testing. Thus highlighting their readiness to take part in the production of media for their own use and/or sharing among them.

However, such encounter also highlighted more about these youngsters' perspectives on videogames than what we have first considered. On their own account, their main source of contact with the creatures of Brazilian myths have been the works of Monteiro Lobato, an author that many of them claim to minimize the role and place of African-Brazilians (such as many of them) within society.

In spite of Lobato's vast contribution to Brazilian culture and the disclosing of Brazilian folklore, making them accessible to a much broader audience, one can notice the subtle underlining prejudice to which some of his characters are addressed to, such as the rural worker Jeca Tatu from his 1918 book *Urupês* and Aunt Nastácia, the black housemaid from his well-known *Sítio do Pica-Pau Amarelo* book series (1920-1947). [15]

For reasons such as these, the students stressed their desire for a game plot that would set itself apart from such materials, embracing a more diverse cultural approach that befits a strongly mixed race country such as Brazil and setting back the Caucasian hero stereotype they are so used to see in videogames, which they expressed in their own words as "there are only white people (protagonists) in games".

This last claim strengthened our understanding for the need of at least a minimal amount of customization for the main character of the game, so they can best identify themselves with its protagonist.

7. CONCLUSIONS

With the work shown here, we aim to bring a contribution for the better and diverse integration of ICT in classrooms by promoting a media that is still seen with some stigma by schools.

We do that because we see such media as having a nearly inherited ability to maintain people's attention and interest, providing virtual environments that are rich in information and that require individuals to employ inductive reasoning in order to understand them and use the resources they provide so as to move forward [28][31][37]. That way, effectively pushing individuals to transform gathered information into knowledge [22][23].

By enhancing these intrinsic traits of videogames with an environment and plot built to provide students with information about cultural aspects of Brazilian folklore, while working on their commitment and eagerness to do so (their motivation), we intend not only to improve students' performance on classes dealing with this subject but, more significantly, disclose to them a part of their country's culture that is often set aside in favor of similar tales and settings from foreign cultures.

A goal that, as detailed along the previous sections, we aim to achieve by letting students become a part of the environment inhabited by the mythological characters that the game presents to them, which will grant them a closer experience with these characters and their tales, letting they "live" as part of their world

and observe their actions, behaviors and motivations in ways that could hardly be achieved by others means than videogames.

Particularly, by doing that we expect students' to better relate to the shown information, enhancing their knowledge about an often neglected part of Brazilian culture while aiding them to better retain and appreciate this knowledge. A perspective that has led us to pay special attention to the works of Malone [26], Malone and Lepper [27], Keller [20][21], Kolb [22] and Kolb and Kolb [23] along our research, for which we are very close to our first testing.

Perhaps more importantly, as section 6.1 might put in evidence, we see the resulting game of this research as an attempt to bring appreciation to a particular aspect of Brazilian culture that we believe is often set aside by a society that has a well-established preference of showing more value to whatever comes from outside the country.

During our further developments of this research we intend to validate the second and third levels of the game (representing, respectively, the Central-West and North regions of Brazil) which are currently under development and are expected to be ready for testing during the first months of the next year. There are also plans for building two additional levels for the game taking into account the findings of the current game development and testing, thus, encompassing the five geographic regions of Brazil in order to better explore the country's cultural diversity.

Moreover, we are currently discussing the adaptation of the game plot of these additional game levels to approach the matter of citizenship, a topic that fits the cultural aspect of the game and that would expand its educational influence even further.

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