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 with the intent to share such information with students and to motivate them to this subject, increasing their interest about it. While this was meant to disclose the selected characters and tales to students, in order to improve their knowledge about them and to enhance their valuing for a neglected part of Brazilian culture, we understand that the game should be able to appeal to students so it could reach those ends. To achieve this, the game was developed with a strong basis on motivational techniques and concepts dealing with the creation of instructional materials and videogames. This process, our assessment of the motivation the game was able to trigger on early teenage students and the next steps to improve this motivation are all detailed in this paper.

Keywords: Brazilian folklore, videogames, motivation, learning.

1 INTRODUCTION

Brazilian schools have been long seen as favoring methodologies and learning topics that aim, near exclusively, to train students to ingress on superior education [29][31].

While this goal is important and should not be disqualified, we believe that it has been overfocused, which thus, leads schools to approach mostly theoretical topics. The result of this is that schools present to their students few topics that tackle the country's cultural diversity or themes that have more practical aspects [29][31].

In that sense, this paper brings a contribution to a more diverse cultural curriculum on schools, by using the Information and Communication Technologies (ICTs) as a medium to the teaching of the myths of Brazilian Folklore and, in doing so, enhancing the motivation of students toward the learning of this subject. To this end, we took advantage of the familiarity and eagerness of students to interact with ICTs, particularly, videogames. Approach that resulted in the built of a game entitled *Folclórica*, meant to teach about different myths of Brazilian folklore.

In the next sections we will discuss the concepts underlying the development of this game, starting from Section 2, in which we will discuss on the reasons why videogames can act as learning tools, on why they can motivate students and how these concepts are connect, in view of the motivational and teaching-learning techniques and concepts that we employed on this research.

On Section 3 we will talk more properly about the game we created. Highlighting its development, target audience, plot, characters and to how it triggers motivation on players while it delivers them information. Section 4 will discuss the methods of the testing of our game with students, the application of the instrument that collected the data about their impressions of

Folclórica and our evaluation of these collected data. Last, Section 5 will show our final conclusions.

2 WHY CAN GAMES TEACH AND HOW DO THEY MOTIVATE?

Today, ICTs are a part of our lives. They largely define how our society works and are easily embraced by its members, especially the youngsters. Additionally, the environments they provide are rich in information [27], but require learners to use inductive reasoning to gather it and put it to practice. A positive process that, among ICTs, is strongly seen in videogames and that has the benefit to allow users (in this case, students) to transform information into knowledge [31][36].

Moreover, the process is enhanced by the sheer number of possibilities in combining different situations and virtual environments, as well as, by the regular use of rewards as response to the efforts and successes of users within these environments. Setting that is likely to attract the attention and commitment of learners [36].

These traits assure videogames a place in education and allow us to introduce in classrooms an ICT common to the daily lives of students. Granting them something familiar to relate to and with potential to enhance their will to engage and succeed in the tasks that are presented to them by the game, i.e. their motivation, due to the direction and purpose it gives to these students [30].

Many authors argue about the ways, or even the possibility, to motivate people in order to engage them in particular tasks. Matter that is tackled according to the perspectives and contexts of each individual research [2][6][34][33]. However, in spite of these differences, they all agree on the key importance played by motivation in the learning processes, due to its power to affect one's desires and whishes in unique ways. Among the compilation of factors listed by those authors, we identified two frequent ones that are approached by us on this paper: the teaching of subjects too distant from the daily lives of students; and the gap between the traditional lecture/test teaching model and the new needs of apprentices born and raised among ICTs.

2.1 Learning through videogames

To this day, most institutions favor the lecture/test model of teaching. However, this model grant students with few opportunities to analyze and to interpret real-world problems or even those suggested in classrooms. Fact that is aggravated during the high school years, when schools focus almost exclusively in preparing students to ingress on superior education or labor market [38][29].

Nevertheless, there is room to change. In 2011, Brazilian government set a list of mandatory curricular topics including themes like the culture and history of African-Brazilian and Indigenous people [29]. Themes that, according to Cascudo [11] – an author whose name is among the most important scholars of the culture and folklore of Brazil –, are two of the pillars the Brazilian folklore.

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In view of such change, we chose to approach this matter by the ICT of videogames, highlighting how educational videogames, often referred to as Serious Games [23], are capable to achieve varying instructional feats through the combination of diverse digital learning practices into an attractive interface.

One that can be tinkered with and explored by students in ways that makes it comparable to an immersive tutoring space, which has learning as a result of the experimentation provided by it and that, might have knowledge as its outcome. Such understanding is closely related to Kolb [21] and Kolb and Kolb [22] Experiential Learning Theory, ELT.

According to ELT, learning is a process in which one's lived experiences are shaped into knowledge through the data collected from them and to how it connects to the apprentice's previous experiences and understandings. Furthermore, as Figure 1 shows, learning is established as a non-stopping cyclic process, in which the learner is continuously creating, testing and reformulating hypothesis to find a solution to a problem. This cycle is divided in two pair of stages.
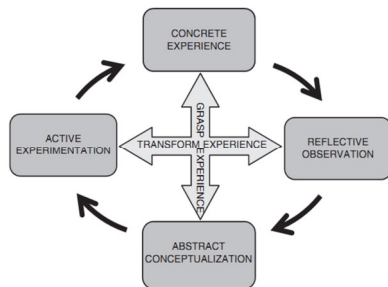

Figure 1: ELT cycle. Source: Kolb and Kolb [22].

The first pair is the grasping of the experience. It deals with the acquisition and comprehension of the experience and is further divided into the *concrete experimentation*, or the use of the five senses to perceive the aspects of the world one is immersed in; and the *abstract conceptualization*, which is the use of reasoning and analysis to interpret this reality.

The second pair is the transformation of the experience, in which the new experience is shaped and connected to previous knowledge. It consists of the *reflective observation*, in which one observes the performance of an experiment by others in order to understand it; and the *active experimentation*, where one takes an active role performing a task to understand it and its results.

There is yet one interesting point about this model. The way learning is hold by ELT not only is supported by videogames as it actually benefits from their environment. This is because the environment videogames create relies on a strong sense of immersion, which thus, provides to ELT a reality to sustain its model. In addition, such environments grant learners a safe ground for experiment and, in turn, simultaneously, enhances their motivation and pushes students to explore them and their tasks even further [23][11][10][1].

2.2 Motivation and learning

Now that we saw how learning can happen through videogames we will focus on how it is affected by motivation and, in turn, how the later can be enhanced through the use of videogames.

The role that motivation plays in learning has risen to a noticeable standard within education. Fact that is due to the understanding that, unmotivated apprentices study very little (or nothing) and learn in the same proportion [5]. In this respect, when dealing with student's motivation in classrooms, we must understand that this learner is regarded as a task performing agent,

one that employs different competencies in the solving of cognitive problems [32].

As result, motivation is granted a prominent role in promoting the active involvement of students with learning tasks as well as the whole learning process. On the other hand, learners who do not invest on this process or that endow minimal effort on it are, very often, branded as unmotivated [5]. However, that is not always the truth.

It is important to note that in many of these situations, teachers are simply detecting the underperformance of the students, that they are being undisciplined, or that they are failing in some aspect of the learning process. For such reasons, there must be caution when branding a student as unmotivated as it might not be the real cause of the student's issues. Furthermore, even when the student is actually lacking motivation, the origins for this problem may be very diverse and have its causes in factors that might be either internal or external to the classroom or even to the whole school environment [35].

Tackling one's motivation is not an easy task. Each person has their own unique interests that affect diverse aspects of their lives, including learning [16]. For this reason, there is not a unique definition for motivation, either for general purposes or learning. On the other hand, there are several list of factor compiled by different authors in regard to their particular researches [2][6][34][33].

In fact, when studying these lists [2][6][34][33], we could identify the two factors approached here: the teaching of subjects too distant from the daily lives of students and; the gap between the traditional lecture/test teaching model and the new needs of the apprentices that were born and raised among ICTs.

These two factors are obstacles that interfere with students' traits as well as with the environmental aspects of the classroom. In this respect, a student's motivation will be the outcome of the convergence of these traits and aspects; however, the very interference of such factors might result in a weak or distorted motivation. Hence, requiring the attention of teachers to be corrected [5].

Particularly, *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 get involved with the classroom activities and subjects. To achieve this, the game was built not only to instruct students, but, as important as that, to be fun. A commitment that is regularly ignored by academics when building educational games and that has led us to resort to the works of Malone [25] and Malone and Lepper [26].

2.2.1 Motivation in videogames, how to do it?

To this day, the works of Malone [25] and Malone and Lepper [26] are references for the inclusion of motivation in educational games (Serious Games). This fact led us to adopt the authors' guidelines in the development of our game. The guidelines consist in four components that must be properly balanced to assure the game's motivation in regard to its level of fun, which are: Challenge, Fantasy, Curiosity and Control.

Unfortunately, these guidelines lack a measurement tool of their own. Therefore, we additionally resorted to Keller [19][20]'s ARCS motivational design model, which takes its name from its four components: Attention, Relevance, Confidence and Satisfaction. In other words, to assert if the environment built by us was capable to motivate the students we tied the four components of the ARCS model to the guidelines of Malone [25] and Malone and Lepper [26].

Particularly, within ARCS, *Attention* regards how easily a player engages and responds to the game environment. In our understanding, this is mainly related to the guideline of Challenge, which shapes the teaching subjects of the environment and

encourages students to reflect upon 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 the ability of Challenge to force players to reflect upon the new experience. However, Curiosity plays an even more important role in *Relevance*, as it makes players wonder about the game mechanics and plot and to experiment with it.

Confidence nourishes in students good expectations about their performances and seems to be evenly connected to Curiosity, which builds up on players' expectations; Challenge, as it puts a limit to what players believe they might accomplish through their skills; and Control, which sets the limit to the total of actions players can actually choose from in order to interfere on the game environment or to try to avoid suffering its interference.

At last, *Satisfaction* will be manifested when students put into practice what they have just learned. While in traditional teaching settings *Satisfaction* may be restricted to the late stages of the learning process, game environments consent it to continuously manifest to players as they progress on the game environment. This manifestation may be more pronounced in specific game moments, like when the player solves a particular difficult puzzle or advances to the next level.

Satisfaction is better connected to the guideline of Control, which establishes an upper limit to the number of viable solutions to any given task of the game. It is also possible for external motivators to act as rewards or as other positive feedbacks to students, by recognizing or praising their efforts (Challenge).

The combination of the ARCS model to Malone [25] and Malone and Lepper [26] guidelines provided a valuable tool to imbue our game with motivation, in a way that assures its level of fun and that makes its measurement possible.

This assessment is granted by Keller's [19][20] IMMS (Instructional Materials Motivational Survey), a 36 items questionnaire that measures the motivation in an instruction material using the ARCS model in regard to each of its components.

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 [19][20]. 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 here is shown in Table 1. It was adapted by Huang et al [17] for measurements in educational videogames. The writing of this questionnaire was further adapted by us in order to better fit the understanding of the age group of our target audience, with no harm to its original structure and meaning. The results we gathered from this questionnaire and our analysis of them will be showed in Section 4.

3 THE GAME

Folclórica [7][8][9], Figure 2, is a game that presents students to different tales and characters of Brazilian folklore. Intertwining these stories into a cohesive narrative meant to inform students and grasp their attention. The game was developed as a 2D single player platform/puzzle game with levels inspired in 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 currently on development. Each of them stands for one of the five geographic regions of Brazil.

Table 1: The IMMS. Source: adapted from Huang et al [17].

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 have seen, done or thought about in my own life.	Relevance
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

We introduced *Folclórica* as part of the program of the discipline of Portuguese Language, within the subject of Literature, of two eighth year classes (the last year of middle

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[1] For more information see http://unity3d.com/.

school) of the Colégio de Aplicação (CAp) of the Federal University of Rio Grande do Sul (UFRGS). Students of these classes ranged in age from 13 to 15 years old.

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

Since it was first brought to the school, the game was met with enthusiasm by the teacher of the Portuguese Language discipline, who saw in it 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 they are often exposed to within school and outside of it.

This matter is all the more important due to, according to teachers from the school, the lack of didactic material concerning the theme of Brazilian folklore and to how its discussion in classes might promote the better valuing, recognition and equal appreciation of the identity, history and culture of the different roots of Brazil [12][28]. Leading students to reflect on the teachings of these cultures and to understand how they are connected to our society and, consequently, how they are related to them and to their lives [12].

3.1   Game development

Folclórica was developed by the authors with this paper, mainly, with the aid of a group of undergraduates from the Computers Tutoring Information Program, kwon as PET (*Programa de Educação Tutorial em Computação*). The aid of this group in the development of the game was very important, as it greatly reduced the budget needed to conduct a research intended to develop a videogame. All the undergraduate students who took part on the project were paid for their work through scholarships.

In addition, the aid of the Portuguese language teacher of the testing groups was also fundamental in defining the teaching topics that should be translated to the game plot and its environment. Her belief in the project led her to take an active role in the writing of the game's narrative along with the other members of the team. Members, who were mainly responsible for the game design, sound, programing and art. A work that was, at large, a practical learning of how to better perform such activities.

Most of the game windows and level background were bought from the Unity Asset Store (https://www.assetstore.unity3d.com/). In contrast, all game characters and cutscenes were draw by an arts' undergraduate who was also a member of the project.

3.2   The target audience and the game importance

As stated in the previous section, *Folclórica*'s proposal was well met by the teacher of the testing classes. In her perspective, using a videogame to present this subject to students provides an interesting contrast to all the information about the mythology of foreign cultures that is often available to them. Either by schoolbooks and lessons or, through several leisure activities like movies, videogames, animations and books [24][12]. Consequently, as we assessed on our first talking with students, they indeed had more knowledge and care for these foreign tales than for the national ones.

Particularly, the fact that the subject mostly lacks different kinds of teaching material made the act of develop and present this game to young students between 13 and 15 years old all the more interesting, as it would play an actual social contribution to these apprentices.

This because, the game would not only ensure the sharing of these stories to new generation, but would also be able to set an interesting way to value the different roots of Brazilian culture and, in doing that, challenging prejudices and stereotypical representations [24]. Prompting students to reflect on how the traits bore by these tales are connected to the most different aspects of our society and of their own lives; like habits, vocabularies or even celebrations [12]. Such as is suggested by the Curriculum Guidelines for the Education of Racial-Ethnic Relations [12][3].

Moreover, students who took part on the research registered their consented to do so by signing documents in compliance with the norms established by the Ethics Committee overseeing their institution. As the participants were all minors, these same documents were also signed by their parents or legal guardians.

3.3   The game plot and how it provides information

The plot of *Folclórica* follows a boy who, while distracted playing on his smartphone, had his younger brother taken away by the Cuca. While he was playing, the boy was constantly interrupted by newsfeed of strange occurrences in Brazil, which bystanders claimed to be the act of beings of Brazilian's folklore. The boy did not know any of the names said and believed it would be more interesting if those were the acts of the foreign mythical beings of his game.

After his brother was taken away, the boy happened to find the hat of the Saci lying on the ground. Moments later, the Saci shows up looking for it. They start talking and, after the boy gives the Saci his hat back the later promises to aid him in finding his brother. After that, the Saci transports both of them 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. However, the two of them are not the only beings of Brazilian folklore within *Folclórica*. As soon as the boy arrives at the new world with the Saci he meets the Boitatá, a giant snake who is distressed because the source of his power, the many fire eyes he has all over his body, have been taken away and scattered.

The Shepherding Little Black Boy is with the Boitatá, trying to keep him calm, and introduces himself to the boy when they meet. Together, the four of them agree that the boy should retrieve the fiery eyes of the Boitatá, to avoid that they set their surroundings on fire. Meanwhile, the others will keep the Boitatá calm and try to find out something about his brother's location.

It is through interactions and dialogs like the one above that *Folclórica* shares information with players. Presenting them to the background and traits of the characters they encounter through their own speech. Therefore, the player learns about Brazilian folklore through its very beings, at the same time that enlightens them about the problems occurring on both worlds, which gives to players the chance to interact with these beings in ways that would be hardly achieved through other media. Additionally, players might gather extra data about those beings, which becomes available through the Pause Menu screens of Figure 3.

While advancing through the game environment and its plot, the players gather information about the Brazilian folklore and are given ways to internalize these experiences and to reflect on their meaning. This process, which might result in learning, is supported by Kolb's ELT [21][22], shown on Section 2.1 and, as described along Section 2.2, is also supported by our views of the significance motivation has on learning, which were employed

through the motivational concepts and techniques seen in Section 2.2 to enhance the motivation of students. Approach that, as will be seen in Section 4.1, we believe was effective in enhancing their motivation.

Aside from Black Faced Ox (which is seen in almost all game levels) all the myths of the first level are strongly tied to the South Region of Brazil it represents. However, there are yet two other characters that appear through all the game, having leading roles:

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 folkloric beings of *Folclórica* were chosen taking into account two aspects. First, the being should be related to the region of the country that is depicted by the game level that it appears. Second, we should be able to relate its background or traits into the developed game plot, thus, keepings its consistency.

The creation of each character's background resorted to many sources. However, the two most prominent ones were the works of Cascudo [10][11] – arguably the most important author regarding Brazilian folklore, having works dating back to 70 years ago – and Garcia [14][15]. For the first level of the game, the South Region of Brazil, the characters are:

- *Black Faced Ox*: an amalgam of different versions of the tales of the Bumba-meu-boi. It speaks of an ox favored by its owner and killed by one of his slaves to feed his pregnant wife. The ox was later revived. The Ox also bears traits of tales about an always angry black ox that runs wild and uncaught through the land. He is mostly known by his lullaby "Ox, ox, ox, Black Faced Ox, take this kid who is scared of grimaces".
- *Carbuncle*: in literature, Carbuncles are small animals with a gem over their heads that can grant wishes, which leads people to trap them for their gems; like the one the player finds and must release in-game. Carbuncles may give their 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, taking her sisters and the man to under the sea.
- *Curupira Wild Boars*: according to legend, the red-head dwarf Curupira is a protector of the woods that commands a big herd of wild boars and rides the biggest of them. In-game, his command over the herd has been broken and now the creatures endanger whoever comes close to them.
- *Shepherding Little Black Boy*: A slave boy who lost the herd of his owner and was left to die as punishment. He was saved by his godmother, the Virgin Mary herself, who put him beyond harm. After that, people began to claim to see the boy leading a herd on horseback, while looking for the lost goods of whomever light him a candle that he can offer to his godmother. In-game, his candles recover the player's lost progress (save points).
- *Boitatá*: A gigantic snake that survived to a flood and ate the eyes of the animals killed on it. The light of the last sun seen by them made the Snake as bright as fire and with control over it. In-game, its eyes have been taken and scattered by the Cuca, risking the near woods to catch fire.

- *Cuca*: at times, she is seen as an ugly old lady, at others, as an anthropomorphic alligator. In any case, she is known to steal disobedient children to eat them. The Cuca is the main antagonist of *Folclórica* and responsible for the strange happenings on both worlds.
- *Saci*: he is a mischievous one-legged black boy who smokes a pipe and wears a red hat. He can travel the land on whirlwinds and, when on good mood, might help others to look for lost goods. In-game, the Saci is a NPC that gives the player information and that saves him whenever he or she is about to die falling from great heights.

3.5   The game connections to motivation

As we stated along Section 2.2 we believe in the importance of motivation for the learning process and on the need to improve it on students. Moreover, we must consider that this motivation is the result of the convergence of each student's preferences with the possibilities (or lack of it) that are offered to him or her by the classroom [5][4].

Therefore, the set of beliefs held by each student about the subject being taught, as well as about what he or she believes that might be accomplished from experimenting with this subject, weights on the interest and perception that they place on the meaning of the tasks that they should perform [4][5]. In other words, by appealing to the individual belief of each student of what they see as accomplishable it is possible to interfere in their motivation, for better or worse, and thus, to give significant meaning to why they should engage such tasks.

In reason of inducing such appeal, we decided to bring the folklore closer to the lives of students, using a media that is common to them, the videogames. Therefore, nearing it to their realities and diminishing the gap between the teaching practice of schools and the current context of the society. Moreover, to approach this theme using a videogame as media has yet another benefit that is tied to Malone [25] and Malone and Lepper [26] guidelines: the concept of Fantasy.

Fantasy concerns the use of imagination to create circumstances that differ from the learners' daily routine. This is achieved by using attractive game settings, characters and plot, in order to instill players with emotional and affective appeal that prompt them to engage in tasks and to nourish an interest in them (*Attention*). Brazilian folklore vastly excels in Fantasy, having many situations and characters that may be adapted to an intended plot. Trait that is strengthened by building properly balanced game challenges capable to appeal to players' *Attention* [19][20].

We also employ Fantasy in the translation of the legends seen in Section 3.4 to our game environment, as so as to create a

meaningful story that connects their most distinguish traits and habitats. Thus, inciting players' Curiosity [25][26].

This approach also links the game plot to the concept of *Relevance* [19][20], which is driven by players' Curiosity to explore and experiment with the game environment, which, in turn, influences their *Confidence* [19][20]. Particularly, players' Curiosity prompts the tinkering with the environment and the formulation and test of hypotheses, which enhances or weakens their *Confidence* due to their belief in what they might accomplish. In turn, this establishes a link with *Control* [25][26], due to its role in setting the actions that players might actually perform when solving the tasks the game asks of them.

Last, players' *Satisfaction* [19][20] will result from their progress on the game, in response to their ability to grasp and use the game's mechanics to solve the challenges it presents them. In other words, it results from the successful combination of all the previous forms of interaction listed in this section, which can be yet enhanced by their perspective of their game score.

3.6   Games with similar background

As a whole, videogames that portray elements of Brazilian folklore are a recent phenomenon. Moreover, even when such elements are portrayed they do not necessarily have a teaching goal and often, simply take advantage of its fantastic and unusual features to create an attractive game environment. Nevertheless, different groups of Brazilian game developers though not in contact with each other share the desire to bring a new perspective to Brazil's folklore and to disclose it to broader audiences.

One of the games we can name among those is *Aritana and the Harpy's Feather*. Released on the second half of 2014 at Steam game distribution platform the game places the player in control of and indigenous kid named Aritana as he faces challenges and characters related to Native-Brazilian folklore. All this while trying to retrieve the harpy's feather of the game title, the last ingredient needed to make the potion that will save the life of the leader of Aritana's tribe [13].

Another similar approach is found on the in-development game Folklore Warriors (Guerreiros Folclóricos) from Unique Entretenimento Digital [18]. Taking strong advantage of the potential for fantasy within Brazilian folklore the game set its plot, like *Folclórica*, in another world in which the beings of Brazilian folklore live and that has being under the attack of the Saci and of his horde zombielike creatures known as Dried-bodies (Corpos-Secos). As of the time of the writing of this paper, no other specific information about the game, which is still under development, was found available.

Both the games above have no distinct educational approach. However, this is not the case of Xilo from the Kaipora Digital game house. Xilo focus on characters of Brazilian folklore mostly common to the northeast part of the country and has the goal to present the culture of this part of Brazil to broader audiences, at the same time that enhances their knowledge about this subject. Such trait places this game within the context of the Serious Games [37].

4   METHODS AND RESULTS

The testing of the game resorted to two eight year classes from the CAp-UFRGS, from which we were able to gather a total of 44 students ranging from 13 to 15 years old. As we stated in Section 3.1, to take part in the research, students had to have the consent of their parents, which was granted by signing of the documents described in that same section.

Once these papers were collected, the research was conducted in the same manner with both classes. There was however on key difference in these procedures. Before interacting with the game, the First Class had a pre-game lesson about the subject they would

be seeing in-game, which focused on the folkloric characters pointed in section 3.3 and on the differences between folklore and mythology. Such topics were worked with students by setting a series of group activities from which they had to choose one to present to their peers during the next class.

Although we reserve a deeper discussion of these activities to another work, it must be noted that the vast majority of the activities presented by these students were deeply appreciated by their classmates and teacher.

On the other hand, as per setting of the methods of our research, the Second class had no such lessons, having their first contact with the content in the discipline directly through the game.

After the game testing, both classes had to answer an assessment created by their teacher that was meant to evaluate how they had absorbed the shared information and, in trying to give it significance, how they had it connected to their daily lives. A discussion that, as the one before, we will be dealing with in our future works. However, in this respect, it is interesting to note that even during the game testing, it was already possible to glimpse the first differences from how both classes reacted to the game due to the methodological differences of our approach in with these classes.

In special, while we noticed that both classes were interested in the game and on the contents it showed to them onscreen, the First Class had much more subsidies to give that information context. Going as far as to express how that what they were seeing on the screen matched the lesson they had had on class. Fact that we believe, also affected the view they had of the game and the motivation that it was able to trigger in them. Matters that will be detailed next, from the data we collected from the classes answering to Keller's IMMS [19][20].

4.1   Measuring students motivation

The IMMS we used to measure students motivation is Keller [19][20]'s tool for measuring motivation within the ARCS model, which we related to Malone [25] and Malone and Lepper [26]'s guidelines, as a way to assure the levels of fun and motivation of our game.

As stated in Section 2.2.2 the IMMS is a 36 items questionnaire that has each of its items connected to one of the four components of the ARCS model. Overall, there are 12 items for the component of Attention, 09 for the Relevance, 09 for the Confidence and 06 for the Satisfaction. At the time of the research, the questionnaire used for it was made available at http://folclorica2.esy.es/. Forty-four students from both classes answered each one of the IMMS items, scoring them with values ranging from zero (totally false) to eight (totally true).

It is interesting to note that, as the preferred answer for each item varies according to what is stated by it, we considered that any given item was satisfied by the game if the average score attributed to it by students corresponds to at least 70% of what would be its preferred score. In other words, an item that has its preferred score as the greatest value possible (eight) is considered satisfied by the game if its average score among students is at least 5.6. On the other hand, if the item preferred score would be the lowest value possible (zero), it is considered satisfied by the game if its average score is no greater than 2.4.

The charts in the following sections indicate the preference of each item for the greatest or lowest value possible by assigning, respectively, a (+) or a (-) next to the number of the item.

4.1.1   Attention

Attention had 12 items within the IMMS questionnaire. From these, as seen in Figure 4, four did not reach our acceptable average scores: items 22, 24, 29 and 31 (see Table 1 for

descriptions). Among these poor valued items there is indication of two particular concerns with our game design.
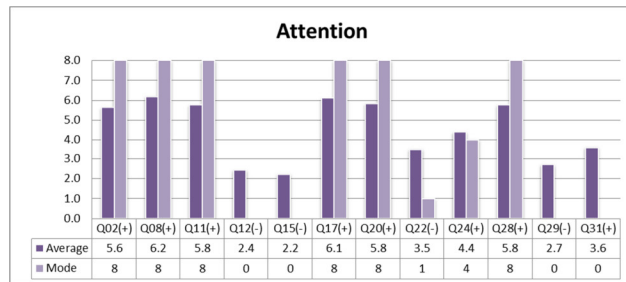

Figure 4: Average answers to IMMS questionnaire: Attention. Source: the authors.

First, it is necessary to revise our game challenges. Especially in what regards their variety and complexity. Both of which, are traits that have a strong connection to Malone [25] and Malone and Lepper [26]'s guideline of *Challenge*.

Second, we must be stricter about the amount of written information that is provided in-game to students. As a rule, the overall amount of in-game written information must be reduced. Resorting to shorter and straighter texts and, whenever possible, excluding them altogether in favor of their integration to the mechanics or challenges of the game.

The current amount of in-game texts affected the ability of students of identifying valuable information. Consequently, interfering with aspects of Malone [25] and Malone and Lepper [26]'s guidelines, specially, the guidelines of *Fantasy* and *Curiosity*.

4.1.2 Relevance

Relevance has 09 items within IMMS, three of which, 16, 26 and 30, did not meet the average score required from them, as seen in the corresponding chart of Figure 5.
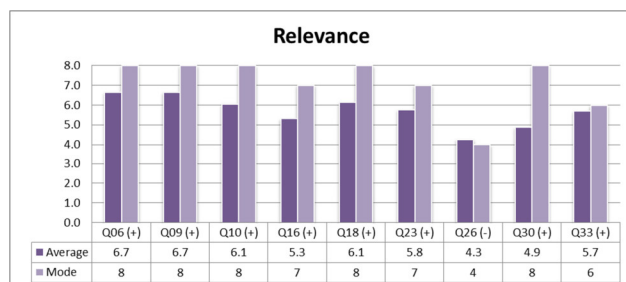

Figure 5: Average answers to IMMS questionnaire: Relevance. Source: the authors.

Among these three items, two call our attention in reason of the poor strength that folklore seems to have on students' daily lives, which are: "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, by itself, a contribution to their change.

Simultaneously, these items point us again to the need of finding better ways to provide to students information about the game characters. In that sense, as we observed during the game testing, although richer character information was available to players, by finding and collection several mini-biographies of characters scattered over the game's world, these data that was found by the students was poorly explored by them. As such, this

does not seem to be the best way to share this information with learners.

A more interesting approach to that would be the integration of the main traits and behaviors of these beings into the game flow and its mechanics, allowing students to absorb this information from it and from the game challenges. This approach seems to enable students to better connect aspects of the game plot to their lives and was well received and assimilated by them when introduced into the game. This was particularly noticed on the game passages of the Black Faced Ox and the Carbuncle, as highlighted by the teacher of the testing groups due to the reactions and conversations of the students, were very well succeeded in these aspects.

Curiously, the 26th item of our questionnaire suggests an amount of care when handling such changes to the game. This item underscored by students states that "26 – *The game was not relevant to my needs because I already knew most of it*", which in turn, raises a questions: "if students say they already knew most of the subject shared to them, then how could they not have enough capability to relate it to their own previous reflections and knowledge?".

In this regard, it is our assumption that the better integration of the shared information to the game's flow will aid students to better realize the depth of this information being shown to them. Inducing their *Curiosity* [25] [26] in a stronger manner and thus, ending with this apparent contradiction.

4.1.3 Confidence

Confidence is another component of the ARCS model that has 09 items on the IMMS questionnaire. The chart with the average values scored by each of these items, Figure 6, shows that four of these nine items did not meet our desired acceptance value: 03, 07, 19 and 34.

Again, the statements of these items point mostly to an excess of text within the game, which had consequences to the *Curiosity* [25][26] of students while they advanced through the game plot and scenario.
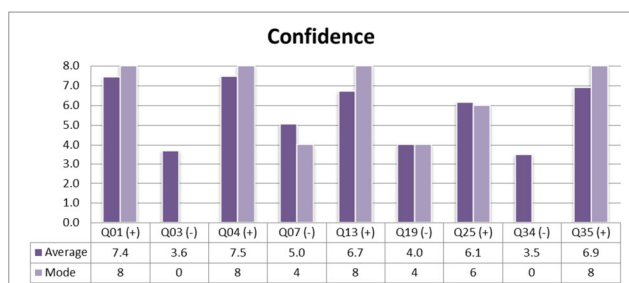

Figure 6: Average answers to IMMS questionnaire: Confidence. Source: the authors.

Another aspect inferred from these items is the frequency with which we place semi-hidden objects along the game levels. The overuse of which, seems to have interfered with the players' feeling of *Control* [25][26] over the game environment. Guideline that, according to these indicators and to the playability observed during the game testing may be benefited by the breaking down of challenges into smaller steps, which would ease the understanding of students of how to solve game challenges.

4.1.4 Satisfaction

The last component of ARCS, Satisfaction, has 06 items within the model. The chart of Figure 7, which shows the average scores assessed by students to each of this items, indicates that two of them, "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" did not meet the required average value.

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

Particularly, the 14th item reached very short of the acceptable value, scoring 5.4 out of a required 5.6. Fact that becomes all the more interesting when was realized that, considering the average scores of each item according to their individual testing class, the class that had the pre-game lesson about the game subject (First Class), was the only one which scored under the 5.6 goal. Finding that make us wonder if such result was actually caused by the pre-game lesson, which (in spite of granting students better context for the game world and the information of folklore it shares to them) might have made the game seem somewhat repetitive for students.

As for item 27, we do recognize that the use of feedbacks after the finishing of game tasks was an underexplored factor, which mostly consisted on the game scores and a few thanks' dialogues between the player and some of the game characters. To better meet this need while keeping the intended text reduction within the game, we mean to resort to the use of iconographies and audios as a way to highlight the efforts of players, *Control* [25][26], in overcoming the game *Challenges* [25][26].

4.2 Students suggestions

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

Curiously, the suggestions of students do assert the considerations we presented from Section 4.1.1 to 4.1.4 thus, highlighting the importance of attending to such aspects in order to improve future versions of the game and of its game levels and narrative.

Eight students did fulfil the suggestions field, from which, four did directly praised the game. Other than that, students also stressed how they liked to find game bugs as it made them feel a real part of the game development process. However, the feeling quickly changed for students that happened to find too many bugs in their gameplay.

The use of audio as feedback was actually also suggested by some students. As well as the use of onscreen iconography to highlight game commands during gameplay, instead of onscreen text, which, according to them, it made difficult to discern important information among all the other written text. Again, pointing to the need of its reduction.

5 CONCLUSIONS

We started this research aiming, above everything else, to bring two main contributions to schools and to the teaching-learning

experience. First, we meant to aid the better diversification of ICTs in classrooms, by nearing these spaces to the technology of videogames that is so common to the daily lives of students, even if, as Van Eck [36] suggests, it is still met with stigma by a diminishing number of educators.

Second, at the same time that we do that, we meant to give students an immersive and interactive environment that shares significant information with them, which, in this particular case, regards information about cultural aspects of the folklore of Brazil. In that, our intention was not only to impact the performance of these students in their classes but, even more importantly, to present them to a part of their culture that is often neglected. All that, while inciting these learners commitment and predisposition to explore such environment further and further. As well as granting these apprentices the chance to learn about the characters of Brazilian folklore through the very words and actions of its beings and from the way they interact with players. That way, promoting a kind of interaction that, as was highlighted by the teacher of the testing classes, is hardly possible using other means or teaching methods.

On that respect, students reactions during the game testing and their dialog with their teacher following it, as well as the very data that we collected from them, thoroughly discussed on Section 4, indicate that *Folclórica* did met these goals. Awakening in students a bigger interest for Brazilian folklore, due to the way it uses its narrative and game plot to present the theme to them, as well as due to the guidance of their teacher during this process.

In addition to that, we comprehend that the understanding of students that we would be using their opinions to improve the game, to better shape it to their needs and desires, aided to reduce their skepticism about educational games. Trait that also aided to create an environment that motivated these learners to keep interacting with it.

Naturally, there is room for further improvements. For a start, after the testing of the first game level we have learned which problems it carries and what must be done to improve the game so it can be more appealing to students. This knowledge will be carried on in the development of the remaining game levels.

It should be noted that the said problems are mostly related to the game design, which strengths the importance of this task and the need to have experienced people conducting it. This expertise would aid in the better use of the game mechanics and of its scenarios as storytellers. Therefore, reducing the amount of text within the game and easing the sharing of information and ideas through the game environment and the interactivity that it provides.

Such changes would benefit the game, reducing its amount of text and possibly enhancing the feeling of immersion that it promotes. However, more than the efforts of the game's development team the proper integration of such changes require investment. This matter has always been one of the major obstacles in creating the game and in implementing the improvements pointed by students in Section 4.2, as well as those pointed by their teacher and by the very members of the development team during the building of the game. Many of which, would require considerable financial investment for hiring people with the proper knowledge to conduct these changes.

Aside from the improvements highlighted along Section 4 and the ones of the above paragraphs, the collected data and the dialogs that were conducted with the teacher of the testing classes after the experiment have made us wonder, if, reversing the approach employed with the testing groups, would result in more interesting outcomes.

That way, students would first have contact with the subject through the game environment and then, be subjected to classroom debates about the information and topics they

experienced in that environment. Approach that might improve the dynamic of fixing the subject and that would avoid students to come see the game as a repetition of subjects previously seen in classrooms, even if in a completely different manner.

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