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# THE USE OF VIRTUAL REALITY AS AN INFORMATION TOOL ON EXTERNALITIES OF ENERGY SOURCES

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## ABSTRACT

Almost daily communication vehicles make some reference to the need to combat the indiscriminated use of fossil fuels and to use less polluting energy sources. In this scenario, nuclear energy should be presented as an option but this is still covered by many myths. Thus, to inform the youth public about the characteristics of the main sources that compose the brazilian energy matrix it is necessary to promote the transfer of knowledge and to demystify the nuclear sector in playful and responsible way.

## 1. INTRODUCTION

Nowadays when talking about nuclear energy, the first thing that comes to the minds of most people is the explosion of an atomic bomb. This sad association is made on account of history itself, which presented the nuclear energy to the world in the form of bombs that devastated the Japanese cities of Hiroshima and Nagasaki. Since then, much has happened and nuclear energy is present in people's daily lives, but it is still difficult to talk about it and mainly to defend the matter.

Therefore, the basis of all the transformation that must occur in the sector is in information. The spread of information and knowledge is changing quickly, and the evolution is almost impossible to follow. Computerization, sharing, connectivity are basic elements of any process whose interest is to develop program of training or simply dissemination of knowledge that uses such an elementary tool as a computer game aims to experience moments of motivation, creativity, absorption of knowledge and several others that make possible the expansion of the communication network and decrease of the difficulties of relationship among individuals.

This paper proposes a game to inform young people about energy sources in general, and draw parallels between them, showing that nuclear energy is competitive and viable, removing stereotypes that surround this type of energy.

## 2. MAIN TARGET

Develop an educational and dissemination tool that can present concepts about the main energy sources, their impacts and their externalities. That helps the nuclear sector in the

process of demystification and contextualizing in a real but responsible way among the others energy sources that makes up the Brazilian's energy matrix.

## 3. THEORETICAL FOUNDATION

### 3.1. Brazilian Energy Matrix

The Brazilian's energy matrix is one of the cleanest on the planet. Almost half of the energy (47%) consumed here is renewable, that is, from resources capable of rebuilding in a short period. The number is highlighted when compared to the world energy matrix, which in 2007 consisted of 82% of fossil fuels.

#### 3.1.1. Hydro power

Generated mainly from hydroelectric dams, is a clean, renewable, non-emitting source of energy that provides low-cost electricity and helps reduce carbon emissions.

#### 3.1.2. Fossil fuel-fired power

Generated mainly from a fossil fuel fired, it is not clean, and it is not renewable energy source as well. It Emits gases that contribute to the greenhouse effect. It is an expensive source, but it is easy and quick to get.

#### 3.1.3. Wind power

It describes the process by which the wind is used to generate mechanical power or electricity. As Hydropower, it is clean, renewable, non-emitting source of energy.

#### 3.1.4. Solar power

**Solar power** is the conversion of energy from sunlight into electricity. Just like Hydropower and the Wind Power, it is clean, renewable, non-emitting source of energy.

#### 3.1.5. Nuclear power

Some particularly large atoms can split in two (or ***fission***), releasing a shockingly large amount of energy. When these atoms were arranged properly in a machine, one splitting atom can cause nearby ones to split, creating a chain reaction. Such a machine is called a ***nuclear reactor***, and can convert the nuclear energy into electricity. It is a clean energy source but not renewable since now.

### 3.2. Virtual Reality

The definition of virtual reality comes, naturally, from the definitions for both 'virtual' and 'reality'. The definition of 'virtual' is near and reality is what we experience as human beings. So the term 'virtual reality' basically means 'near-reality'. This could, of course, mean anything but it usually refers to a specific type of reality emulation.

## 4. THE GAME DEVELOPMENT

### 4.1. The Main Tool

Any computer game needs a game development tool to be created.

The tool used to create the game about externalities of energy sources was Unity 3D, because it presented simple features of easy application.


**Figure 1: Game development view using Unity 3D.**

### 4.2. The Public Target

Although the game can be played by people of all ages, there was a concern to target a public still in elementary school, but age classification would only become more evident after the approach with teachers. It was evidenced that children over 10 years old and adolescents would be within the group capable of giving the desired response by game designers, which is to disseminate the idea that nuclear energy is a real and concrete possibility within the universe of the Brazilian's energy matrix.

### 4.3. The First Approach

Before submitting the game to the target audience, that is, children and adolescents, we try to know if it can be considered as a learning tool to be even used by educators. For this we took the game for these professionals to evaluate it. The results presented in this paper will be based on information obtained from these teachers.

#### 4.3.1. The survey

As a learning tool, the proposed Game should be evaluated by teachers. These have competence to characterize it with an object of teaching and classify it within the school universe. In this way, primary and secondary school teachers are being heard. The data analyzed here introduce the first phase of this research. This first phase was, in fact, a phase of the research tool's adaptation, where it was tried to identify how the approach with the teachers should be done, that is, what the questions and presentation material would be.

Primarily, the research was composed of 8 questions to observe the application of the game as a learning object and how much repositories of learning objects are really used, to verify the effectiveness in leaving the game published in these platforms. In this paper only the issues that deal with the applicability of the game will be discussed.

### 4.3.2. The issues

The three issues discussed here are:

- Do you use learning object in your classes?
- Do you use any learning object repository?
- Do you think the game presented can be used as a learning object?

**4.3.2.1.** The first issue

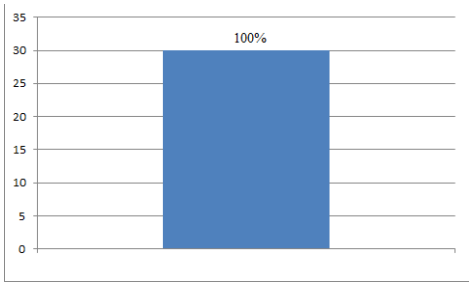


**Figure 2: How many teachers are using learning object in classes.**

**4.3.2.2.** The second issue

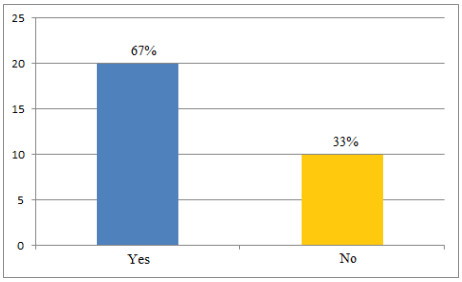


**Figure 3: How many teachers are using learning object repository.**

**4.3.2.3.** The third issue

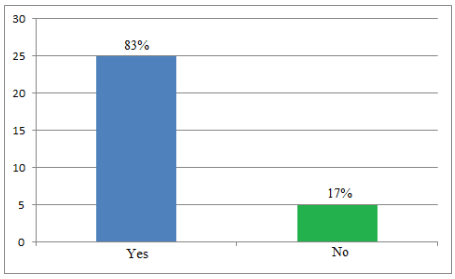


**Figure 4: The game presented can be used as a learning object.**

## 5. RESULTS

### 5.1. The Game

After 6 months of work, the game about externalities of energy sources already has 3 forms of presentation: Windows, Android and Virtual Reality.

It is true that the latter is still in development, but certainly it is playable. The game is now in the test phase of both computing routines and information contents. Because of this, teachers

are being heard and invited to suggest ideas and contents to improve and to leave the game closer to its goal, which is to take information and help overturn myths, especially about nuclear energy.

### 5.2. The Survey

A first fact to be noted in the first issue is that the question was probably poorly formulated. As it was posed by some researched people, everything used in the classroom is an object of learning, so there is a need for a higher specification, for example, asking if the teacher uses a digital learning object in the classroom.

The second issue also shows an important fact that many teachers still do not know repositories of learning objects and how much they can improve their classes.

And finally, the third issue demonstrates the applicability and consequently the success in offering the game as an object of learning for fundamental students.

## 6. CONCLUSIONS

This work is just beginning, but what seems to be already well evidenced is that the game about energy source externalities can be presented as a learning object. But the suggestions should be implemented before the game be presented again to teachers. Once approved by the teachers, it can be taken to the students so that their effectiveness is really evaluated.
The evaluation issues also needs to be reformulated to improve the quality of the responses and consequently present results that best represent the author's goals.

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