# ESG+P Evolution: A Videogame Proposal for Teaching the New ESG Concept

**Miguel Nascimento[1], Gabriel Nascimento[1], Marcus Parreiras[1],**
**Marcos Magalhães[1], Geraldo Xexéo[1]**

[1] LUDES - Programa de Engenharia de Sistemas e Computação
COPPE - Universidade Federal do Rio de Janeiro
Avenida Horácio Macedo, 2030, CT, Bloco H, sala 319, Rio de Janeiro, RJ - Brasil

`{mparreiras,xexeo}@cos.ufrj.br,`

`{gabriel_santos,miguel.santos}@ic.ufrj.br`

***Abstract.*** *This article presents a proposal for a digital game that aims at teaching sustainability concepts. With technological advances, the use of digital games as a form to keep students engaged in learning a new topic has become a viable possibility to facilitate teaching. The game simulates the management of a company, in which the player must make decisions pertaining to Environmental, Social, Governance, and People dimensions. The purpose of this game is to teach students real concepts of organization sustainability through its narrative and gameplay.*

***Keywords.*** *Educational Games, ESG+P, Sustainability*

## 1. Introduction

This paper presents a proposal for a digital game aimed at teaching sustainability concepts, particularly those related to the sustainability framework ESG+P framework (Environment, Society, Governance, and People) [Magalhães 2022]. Sustainability education has become increasingly important in recent years, with a growing recognition of the urgent need to address environmental and social issues. However, teaching sustainable development concepts can be challenging, especially when it comes to engaging students and providing hands-on experience [Martins et al. 2006]. In order to overcome these challenges, educators have turned to innovative approaches such as games to increase learning effectiveness and engagement. The use of games as an instructional tool has been shown to have a wide range of benefits, including increased motivation and persistence among players [Gee 2007, McGonigal 2011].

While a board game version of the concept already exists [Magalhães et al. 2023], the proposed digital game seeks to provide a more interactive, immersive and realistic experience for students. The game will allow students to simulate organizational scenarios and challenges related to sustainable development, while also providing opportunities for reflection on the impact of their decisions on stakeholders.

The paper will also briefly discuss the development process of the digital game, which we decided to name ESG+P Evolution, including the design considerations and technical aspects.

By using a Game Based Learning (GBL) approach, this proposal aims to make sustainability education more accessible, interesting and effective for students.

## 2. Related Work

Game Based Learning has become a buzzword since a famous TED Talk from McGonigal, that lead to the bestseller "Reality is Broken" [McGonigal 2011]. Its use in education can be traced to card games in France in the beginning of XVI century [Jung 2021], and the defence for digital games has been growing [Prensky 2001, Gee 2007, McGonigal 2011, Mayer 2019].

[Mayer 2019] did an analysis on the benefits of using computer games for educational purposes, focusing on three genres of scientific research on computer games for education: value-added research, which questions if adding a feature to a game leads to improvements in learning; cognitive consequences research, which questions if playing a game can improve the player's skill in a related topic; and media comparison research, that analyzes if people learn better through conventional media or through playing a game. The third genre of research showed that educational games have the potential to be just as effective in teaching as conventional media.

[Fabricatore and López 2012] examined how digital games can be used to teach how to deal with complexity in the domain of sustainability. It found most sustainability games are focused on the environment and usually meant as educational tools for children, which could result in neglect for other age ranges that also need to learn about sustainability. However, it also found most games tended to ignore social issues.

Some authors have explored the use of digital games for learning purposes, specifically aimed at teaching topics related to environmental education. [Parreiras et al. 2022a] created Salve a Terra!, a collaborative videogame intended to raise awareness about environmental sustainability. In this game, multiple players must use cards that represent pro sustainability actions to remove cards representing garbage, that are spread across the board.

[Ghilardi-Lopes et al. 2015] created a game with the purpose of teaching students about global environmental change and the effects that it brings to coastal and marine ecosystems. The game is set in Apicum, a fictional coastal town, that is suffering from unusual events, such as higher temperatures and raining intensity, and the player must go through multiple levels to investigate what is causing said events, earning points in "Environment", "Society" and "Economy" as they progress. The goal is that, as the player progresses, they are exposed to concepts related to climate change, such as greenhouse effect and coral bleaching.

## 3. Game Design

In this article, we decided to use the MEDIEVAL (Method for Designing Virtual Educational Instruments with a Playful Approach) [Parreiras et al. 2022b] as the design method for our game. MEDIEVAL consists of ten steps that guide the process of creating educational games in an incremental and interactive manner. We have already performed the first 6 steps.

### 3.1. Step I - Identify the problem and motivation

In this step we decided that one of the fundamental changes to be made is to give the players more grounded ideas and knowledge relating to sustainable development as they

2

play the game. This is known as procedural rhetoric [Bogost 2007], the idea that games can make statements about the world through its narrative and mechanics. To achieve this, we will modify the events in the game, turning them into random events with different probabilities, since the board game uses a uniform distribution based on a set of cards. For instance, operating losses due to accidents during cargo transportation might happen more often than the creation of new legislations.

## 3.2. Step II - Infer the objectives for the solution

In this step, we decided to use the Revised Bloom's Taxonomy to identify specific learning objectives related to the video game adaptation.

Another decision was to emphasize how the transition to a digital format allows for more interactive gameplay mechanics, visual storytelling, and the integration of multimedia elements to enhance the educational experience.

A narrative will also be added to the game, so that the player can understand the reasons they are taking such actions and become more engaged with the tasks. This is intended to be shown through text windows during the player's progress.

The story will be about a businessman who needs to attract investors to save their declining company. The player can check the company's situation through the resource screens. Depending on the player's final score, the businessman either manages to save the company or must declare bankruptcy.

## 3.3. Step III - Plan the game that solves the problem

In this step, we define the general characteristics of the video game adaptation, taking into account the advantages offered by digital platforms. We also highlight the potential for enhanced interactivity, immersive graphics, and audio effects that can effectively convey the sustainability message and create a more engaging and memorable experience for players.

Table 1 shows the suggested changes to be made for the digital version of the game. Instead of simply having four resources (E, S, G, and P), the digital game will adopt all 16 detailed metrics present in [Magalhães 2022]. This allows for a more comprehensive representation of the impact of the player's decisions.

For instance, an action that causes dissatisfaction and a bad image for the company may result in a decrease in the Reputation and Recognition (G4) resource. The loss in reputation for the company would be more tangible, which better conveys the ideas that the game wants to present. Furthermore, a loss in one resource and gain in another are not mutually exclusive, as an action that causes bad PR may lead to a decrease in the reputation of a company, while still generating profit, leading to a gain in the Economic Results (G2) resource.

## 3.4. Step IV - Apply Endo-GDC for a holistic view of the game

In this step, we used the Endo-GDC canvas [Taucei 2019] to explore the possibilities that the video game format brings to the overall design. We focused on the dynamic and interactive nature of a video game can enhance engagement, foster a deeper understanding of sustainability concepts, and allow for more effective learning experiences through gamified mechanics and captivating visuals.

| Subject | Board version | Digital version |
|---|---|---|
| ESG+P resource name | Four resources - E, S, G and P | Each resource is divided into four metrics |
| Immersion | Straight to the game, no narrative | Can introduce narrative and procedural rhetoric |
| Investment | Four dice are rolled, player chooses two to invest and in which resources | Randomly generated numbers in a wider range for each field values added to all four metrics of said field |
| Action cards | Four cards drawn from a deck, player chooses a card then an action | Turned into random events, player still chooses an action |
| Consequences of actions | Simple, easy for mental calculation | Can be more complex, have multiple consequences |
| Event cards | Named "events" | Renamed to not conflict with the new event cards |

**Table 1. Suggested changes to be made in the digital version of the game**

### 3.5. Step V - Create the GDD to detail the planned features

In this step, we elaborated on the GDD[Motta and Junior 2013] to document the structure and specific advantages of the video game adaptation, including improved player immersion, the ability to simulate real-world scenarios, and the potential for collaborative gameplay experiences.

### 3.6. Step VI - Choose the most suitable engine

In this step, we selected the Unity engine as our development platform, emphasizing its capabilities in creating rich and interactive video game experiences. ¨Unity, is an engine developed by Unity Technologies that can be used for creating both 2D and 3D games using the C# language and allows porting said games to multiple platforms such as computers and smartphones.

### 3.7. Pending Steps

Steps VII and VIII, which are pending, involve the development of the video game software and assets. We will emphasize the advantages of a video game's dynamic nature, including the ability to provide immediate feedback, adaptive difficulty levels, and personalized learning experiences. We will also highlight how the integration of multimedia assets, such as high-quality artwork, sound effects, and animations, can enhance the overall gaming experience and effectively convey sustainability-related content.

Steps IX and X will focus on evaluating and testing the effectiveness of the video game adaptation, highlighting the advantages of using a video game as an educational tool. We will emphasize how the interactive nature of the game allows for real-time assessment, progress tracking, and adaptive learning experiences. The results obtained will be shared with the scientific community, emphasizing the unique advantages of using video games to promote sustainability education and inspire positive action.

The revised version ensures that the advantages of transitioning from a board game to a video game format are highlighted in each step. We emphasize the potential for enhanced interactivity, immersive graphics, dynamic storytelling, adaptive learning experiences, and the ability to engage a wider audience when addressing sustainability issues through a video game medium.

## 4. Current state of the project

The game is currently under development, and Figure 1 shows a mockup of the screen for the investment step, where the player must choose one of the investment options presented. The buttons located on the side of the screen would take the player to different screens, each displaying different information for the player to see, to give them a detailed rundown of their match.
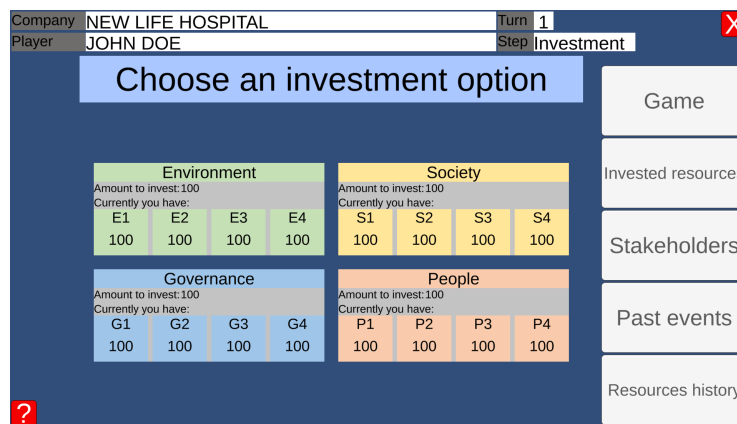


**Figure 1. Investment screen mockup**

Among the intended screens, there is information pertaining to the amount invested in each turn, a screen showing the stakeholders' minimal score for satisfaction, a screen showing the events that were applied to the player through the game, and a screen showing a history of their resources.

## 5. Conclusion and Future Work

With the widespread use of mobile devices on the modern day, it raises the possibility of using said devices in an educational manner. Not only that, the use of these technologies in conjunction with gamification techniques can be useful for maintaining the student's engagement when learning about a topic.

This game is intended to be a form of keeping students engaged when learning about ESG concepts, while using the ESG+P[Magalhães and Eckschmidt 2021] approach for Sustainable Development, that incorporates People as a new dimension to be used for the concepts. The objective of using the game as a teaching method is to encourage the students to think about what actions a company would take to attain their goals, while also considering the consequences one action may have over another.

For future work, it is intended to continue the implementation in Unity, in order to have a fully functional game made with the suggested changes in this paper. It is also planned to port the game to mobile platforms, so that can be played in smartphones in a classroom, for instance.

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