The Circular Game: The Impact of Gaming on Sustainable Behaviour

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Abstract: The main objective of this paper is to assess the impact of The Circular Game use on participants' sustainable awareness, learning and behaviour. The Circular Game is a strategy board game to learn about sustainability, improve environmental awareness, apply circular economy strategies, and train to design innovative and circular business models. Researchers will analyse changes in participants' sustainable knowledge, awareness, and behaviour before and after participation in the game with ad hoc questionnaires. The results of this analysis will allow us to test whether the emotions generated during the play-based learning process can condition their environmental awareness, learning and behaviour towards greater sustainability in the future. The game can generate emotions in participants and work teams, promote collaborative and green knowledge acquisition, and help bachelor and master students and employees apply theoretical knowledge to real-world situations. Similarly, companies and entrepreneurs need a relaxed environment to present their ideas and proposals for improvement. This methodology uses game elements in academic or working environments to stimulate and challenge participants to incorporate sustainable business choices. The Circular Game is a game in which participants compete to be the company that applies the most circular economy strategies in its business model. The groups advance through a circular board where, depending on the squares they land on, they can earn money, invest in circular economy strategies, and add or reduce CO2 emissions. The winner will be the one who has completed all the circular economy strategies set out in the game with the minimum of CO2 emissions. The social impact is substantial as it is a methodology that can be applied in any field, educational or business. The impact will be more significant if the game's objective, to be more sustainable, is translated into the participants' real lives.

Keywords: Sustainable behaviour, Game-based learning (GBL), Board games, Environmental Sustainable Education (ESE), Education for Sustainable Development (ESD), Environmental awareness.

1. Introduction

The climate emergency has raised the importance of incorporating knowledge and sustainability awareness. Education for sustainable development has gained attention in higher education, particularly since the Brundtland report in 1987 and the Rio-1992 Conference; both stress the need to integrate sustainable development in business education. Since then, the terms Education for Sustainability (ES), Environmental Sustainable Education (ESE) and Education for Sustainable Development (ESD) have gained international usage (Shrivastava, 2010; Gatti, Ulrich and Seele, 2019).

ESD affects not only the content of education but also its process and outcomes. This requires a new learning culture based on participative processes and new teaching techniques. Among the different methods and techniques, as typologized by Figueiró and Raufflet (2015), action and experiential learning methods offer a promising approach to sustainability teaching. This paper explores a teaching experience based on the action and experiential learning approach, specifically game-based learning (GBL). ESE and ESD can and should be learned and practised at all educational levels, in formal and informal contexts, and even in professional settings. ESE can help change attitudes and behaviours towards environmentally friendly practices (Janakiraman, Watson and Watson, 2018).

This research aims to analyse the impact of using a board game, The Circular Game, in the learning process of teaching sustainability and environmental awareness. The Circular Game is a competitive board game for different environments: secondary education, university education, and professional settings. The expected results of its application aim to find evidence of greater environmental awareness when its concepts are learned and worked on in groups through a game that motivates and encourages more sustainable behaviour among its participants in a competition framework.

2. Theoretical Background

Gamification is applied to encourage behavioural change and promote desired attitudes in different fields such as health, psychology, education, etc. (Almarshedi et al., 2017; King et al., 2013; Chow et al., 2020). Dieleman

and Huisingh (2006) discuss the relevant role of games in all four learning phases (concrete experiences, reflective observation, abstract conceptualisation, active experimentation) of experiential learning (Kolb, 1984).

Hammady and Arnab (2022) review the most adopted theories for designing Behaviour Change Games. There are three: (1) 'Self-Determination Theory' as it is empirically based on human motivation. (2) 'Theory of Planned Behaviour' suggests that desired human social behaviour comes from behavioural, normative, and control beliefs. (3) Social Cognitive Theory (SCT) introduces behaviour change as a function of improved skills and confidence or self-efficiency in performing the new behaviour. These three aspects bring the elements that should have a game designed to change the behaviour concerning sustainability.

Also, according to educational theory, there are two main areas of learning in higher education: cognitive and affective learning. The first domain relates to acquiring knowledge and understanding (cognitive outcomes), while affective learning involves values, attitudes, and behavioural intentions (affective outcomes). Following Shephard (2008), especially in sustainability education, the affective dimension of learning seems to be an essential part of the learning experience because it appears to stimulate critical and creative thought in sustainability, which is one of the most important targets of ESD (Figueiró and Raufflet, 2015).

3. The Circular Game

The Circular Game aims, among other things, to raise awareness of the different circular economy strategies, promote sustainable behaviour, and invite people to reflect on how companies operate and the different possibilities when deciding how to conduct their business. It is a competitive board game for 2 to 6 players. The game elements (boards, cards, dice, and coins) try to reflect different elements of the circular economy in a business context. The game aims to complete two strategies in each product's five life cycle stages with the least CO2 emissions.

Each of the elements of the game has been designed concerning the elements and strategies of the circular economy:

- Central board. The central board is circular and divided into five consecutive sections corresponding to the five phases of the product lifecycle: eco-design, raw materials, production, use and lifetime of the product, and waste management. The starting square is the Eco-design section; players roll dice and progress through all game sections by drawing cards until they complete two circular strategies.
- Player's board. Each player has a board on which they must fill in two strategy cards from each stage of the product lifecycle.
- Strategy squares: Each of the five sections of the central board relating to the five stages of the product lifecycle has two squares where the player can buy a strategy related to that stage (eco-design, raw materials, production, use and lifetime, and waste management). In the strategy squares of the Eco-design section, the player can buy strategies from any part of the cycle.
- Strategy cards. The strategy cards explain different circular economy strategies related to each part of the cycle. Players must complete two strategies from each section on their player's board.
- Action cards. Action cards add a chance and fun component to the game, as they can mean going to jail for committing an environmental crime, not complying with the law, increasing CO2 emissions, or being out of the game for a turn.
- CO2 emission tokens. With the circular economy strategy cards, players accumulate CO2 emissions that limit the chances of winning the game.
- Greencoins. Greencoins are coins that allow the purchase of circular economy strategy cards. Each time the product's lifecycle starts, players accumulate greencoins when they pass through the starting square.
- Dice. The dice is the element of chance that allows you to move around the board.

The player who completes two circular economy strategies from each product lifecycle stage and accumulates the least CO2 emissions wins the game. As players move through the different squares of the game, they relate strategies to the various stages of the product lifecycle, learn the need to address each of these stages sequentially, and become aware of reducing environmental impact through CO2 emission tokens and possible penalties for non-compliance with environmental laws.

4. Research Design

The research methodology is based on collecting information before and immediately after participation in the game. A pre-game and post-game questionnaire will be developed to evaluate it with a sample of 50-60 volunteering undergraduate students enrolled in the 2nd year of Management Degree at Universidad de Burgos, Spain. Questionnaires will be developed to measure students' knowledge and awareness about sustainability and their perceptions of the importance and relevance of the topic in the business field. The "before" questionnaire will be conducted before introducing the game, while the "after" questionnaire will be collected at the end of the debriefing discussion following the game. Both questionnaires were collected in the classroom. The students who play several rounds also do the test before and after each round.

Questionnaires include sociodemographic data (gender, age), questions concerning circular economy concepts and practices, questions regarding sustainable behaviour, and others related to the gamified experience.

In addition, to evaluate gamified experience, we will use the Gamified Game Experience Scale (GAMEX) (Eppmann, Bekk and Klein, 2018), validated in the Spanish population by Parra-González and Segura-Robles (2019). It comprises 27 items grouped through six subscales evaluated through a five-point Likert scale (1 = Strongly disagree; 5 = Strongly agree): Fun, Absorption, Creative thinking, Activation, Negative affect, and Dominance. The GAMEX index has been validated as a valuable resource for measuring gamified learning experience results.

Despite being designed for higher education, The Circular Game can help raise environmental awareness and develop soft skills in secondary education and workplace settings.

5. Conclusion and Future Research Lines

Applying The Circular Game and the research findings from this study could provide insights into the impact of GBL and gamification on sustainability and the circular economy. The results will show whether the application of the game increases environmental awareness, learning about the circular economy, and expected sustainable behaviour. The improvement and the relationship between these items (awareness, learning, and sustainable behaviour) through the game will allow us to know if the design of GBL methodologies is more effective than other environmental awareness and training campaigns.

Analysis of student questionnaire responses will reveal how the game has contributed to knowledge acquisition in the circular economy, environmental awareness enhancement, and sustainable behaviour. Furthermore, the results will indicate undergraduate students' perceptions regarding incorporating dynamic elements in the learning process and whether these techniques enhance motivation for regular courses.

Future research will also explore differences between groups of students from different backgrounds. It could also compare the improvement in environmental awareness following a traditional classroom lesson on circular economy and sustainability versus a gamified experience with The Circular Game. In addition, the game could serve as a tool for companies to foster employee engagement and environmental knowledge and promote integration and teamwork. Therefore, if implemented in corporate settings, the researchers will try to replicate the study among this population and compare the results between educational and professional contexts.

Acknowledgements

The authors would like to thank the financial support of the University of Burgos by the program "*Convocatoria de Ayudas a Grupos de Innovación Docente de la Universidad de Burgos para la elaboración de materiales docentes para los años 2023 y 2024".*

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