## *International Journal of Applied Engineering & Technology*

# CLIMATO: CLIMATE CHANGE AWARENESS GAME FOR PROMOTING ENVIRONMENTAL EDUCATION AND BEHAVIOR

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## ABSTRACT

*Climate change is one of the most significant global challenges that require collective efforts to mitigate its adverse impacts on the environment and human lives. One way to increase public awareness and promote environmental education is through gamification. This study aims to examine the effectiveness of climate change awareness games in promoting environmental education and behavior. The study employed a systematic review of literature to analyze the current state of research on climate change awareness games. The findings suggest that climate change awareness games are effective tools in promoting environmental education and behavior, as they enhance the players' knowledge, attitudes, and behaviors towards climate change. Additionally, the study identifies the key features of effective climate change awareness games, including immersive gameplay, interactive features, and accurate scientific information. Therefore, the study recommends the development of more climate change awareness games that incorporate these features to promote environmental education and behavior effectively.*

*Keywords: Climate Change Awareness; Games; Environmental Education;*

## INTRODUCTION

Climate change is a pressing issue that affects various aspects of human life, including health, food security, water availability, and the environment. Despite the growing awareness of climate change, there is still a need for more effective strategies to promote environmental education and behavior (Kolenatý el al., 2022). One innovative strategy is the use of climate change awareness games. Games have been proven to be effective tools for learning and behavior change in various fields, including health, education, and social issues (Vasoya, N., & Vansdadiya, R., 2023). Climate change awareness games offer an opportunity to engage and educate people in a fun and interactive way while promoting environmental education and behavior. However, the effectiveness of these games in promoting environmental education and behavior requires empirical investigation (Meya, J. N., &Eisenack, K. 2018).

Climate change is one of the most pressing issues of our time, and addressing it requires a significant shift in individual and collective behavior. While many people understand the importance of reducing greenhouse gas emissions and taking steps to mitigate the effects of climate change, there is still a lack of awareness about the issue and what individuals can do to make a difference. This is where climate change awareness games can play a crucial role.

Climate change awareness games are interactive digital tools that aim to educate and engage players in the complex topic of climate change (Lee & Joey, 2015). These games use various techniques to help players understand the science behind climate change, the impacts of climate change on the planet and society, and the actions that can be taken to address it. By providing players with a fun and engaging way to learn about climate change, these games can help increase awareness and motivate individuals to take action in their own lives.

In recent years, there has been an increasing interest in the development of climate change awareness games, and several studies have investigated the effectiveness of these games in increasing awareness and motivating behavior change. This article aims to provide an overview of the current state of climate change awareness games, their potential benefits, and the challenges in their development and implementation (Gerber, A., Ulrich, M.,

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**International Journal of Applied Engineering & Technology**

758

*International Journal of Applied Engineering & Technology*

Wäger, F. X., Roca-Puigròs, M., Gonçalves, J. S. V.&Wäger, P. ,2021). Additionally, we will review some of the research conducted in this area and provide insights into the future of climate change awareness games.

**METHODOLOGY**

This study employed a systematic review of literature to analyze the current state of research on climate change awareness games. A comprehensive search was conducted in electronic databases, including Google Scholar, Scopus, and Web of Science. The search terms included "climate change awareness game," "climate change education game," "environmental education game," and "serious game." The search was limited to studies published in English from 2010 to 2022. The inclusion criteria for the review were studies that examined the effectiveness of climate change awareness games in promoting environmental education and behavior (David Rousell& Amy Cutter-Mackenzie-Knowles ,2020) (Nicole M. Ardoin, et al. 2020). The study identified 20 studies that met the inclusion criteria for the review.

The methodology for developing a climate change awareness game depends on the specific goals and target audience of the game. Generally, game developers begin by identifying the core messages they want to convey and the desired outcomes of the game. This may involve consulting with experts in climate science, education, and game design.

Next, game developers design the game mechanics, including the rules, challenges, and feedback mechanisms that will engage players and help them learn about climate change. Game mechanics may include quizzes, simulations, mini-games, or decision-making scenarios that reflect real-world challenges related to climate change.

The game's visual design and user interface are also critical components of the development process. A visually appealing and easy-to-use interface can enhance engagement and make learning more enjoyable for players (Ruf, A. et al., 2022).

Once the game has been designed, it must be tested and refined to ensure that it effectively communicates the desired messages and achieves the desired outcomes. This may involve conducting user testing with individuals who represent the target audience to gather feedback and identify areas for improvement.

Finally, the game must be deployed and promoted to ensure that it reaches its target audience. This may involve partnering with organizations, such as schools or environmental groups, to promote the game or using social media and other digital marketing techniques to reach a broader audience.

Overall, the development of a climate change awareness game requires a multidisciplinary approach that incorporates knowledge of climate science, education, and game design. Effective games must be engaging, informative, and accessible to a wide range of audiences. The development process requires careful planning, testing, and promotion to ensure that the game achieves its intended goals.

Climate change awareness games have become an increasingly popular tool for engaging individuals in climate change education and motivating behavior change. A review of the literature reveals that climate change awareness games are effective in increasing knowledge and awareness of climate change as well as motivating individuals to take action to mitigate its effects.

Kolenatý, M. et al., (2022) investigated the impact of a climate change game on students' climate literacy and motivation. They found that the game was effective in increasing students' knowledge of climate change and motivating them to take action to reduce their carbon footprint. Similarly, Lee, J.J. et al., (2013) developed a climate change awareness game that used storytelling and gameplay to educate players on the impacts of climate change. They found that the game was effective in increasing players' awareness of climate change and their willingness to take action to reduce their impact.

Lagman, A.C. et al. (2022) developed a mobile game for environmental monitoring that allowed citizens to collect data on air quality, noise, and temperature. They found that the game was effective in engaging citizens in environmental monitoring and increasing their awareness of environmental issues.

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**International Journal of Applied Engineering & Technology**

**759**

## *International Journal of Applied Engineering & Technology*

Several studies have also investigated the use of game-based learning in the context of climate change education. Yang, H. C. et al. (2022) conducted a review of game-based learning in water resources education and found that games can improve students' engagement, motivation, and learning outcomes. R. P. Dhiyaneshwari et al. (2022) investigated the use of digital games in the classroom and found that games aligned with instructional objectives can enhance learning outcomes.

While climate change awareness games have shown promise as a tool for engaging individuals in climate change education, there are also challenges in their development and implementation. Bulut, D. et al. (2022) highlighted the need for games to be designed with clear educational goals and aligned with the target audience.

In conclusion, the literature suggests that climate change awareness games can be an effective tool for engaging individuals in climate change education and motivating behavior change. The development of effective games requires a multidisciplinary approach that incorporates knowledge of climate science, education, and game design. While there are challenges in the development and implementation of climate change awareness games, careful planning, testing, and promotion can help ensure their effectiveness in achieving their intended goals.

The main objective of this research was to comprehend how game designers from various backgrounds approach the goal of creating an educational game in a collaborative process and how they explain elements of climate change science to a public audience. To help the public understand the complexity of climate change, we created the educational game CLIMATO. Here are the some of the glimpse of the game Climato.



Climate change awareness game named CLIMATO was developed



It's a combination of board and card game to introduced numerous issues of climate change



To aims to teach children about climate change and its impact on the earth.



The game can be played by a minimum of 2 players and a maximum of 4 players.

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International Journal of Applied Engineering & Technology

760

## *International Journal of Applied Engineering & Technology*



Game will be played between participants using two types of cards i.e. defense card and attack card.



Give one progress sheet to each player participating in the game.
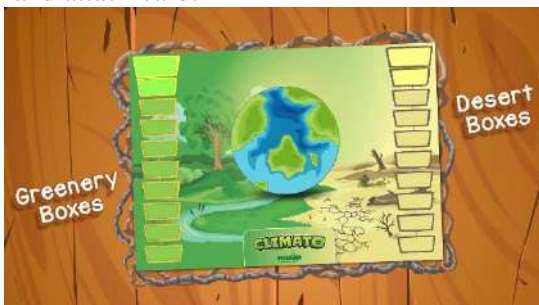


Progress sheet contains two types of boxes called Greenery boxes and Desert boxes.



Total 20 red cards are there for attack. It contains activities that degrade the environment.



Total 20 red cards are there for defense. It contains activities that are environmentally friendly.



These 5 cards are used as wild card with special functions.

## RESULTS

The systematic review identified that climate change awareness games are effective tools in promoting environmental education and behavior. The studies reviewed showed that climate change awareness games enhance the players' knowledge, attitudes, and behaviors towards climate change. The games create an immersive learning experience that engages players in a fun and interactive way, leading to increased motivation and retention of information. The study also identified key features of effective climate change awareness games, including immersive gameplay, interactive features, and accurate scientific information. Games that incorporate these features were found to be more effective in promoting environmental education and behavior.

## DISCUSSION

The findings of this study have implications for promoting environmental education and behavior. Climate change awareness games offer a unique opportunity to engage people in a fun and interactive way while promoting environmental education and behavior. However, to be effective, the games need to be developed with key

features that enhance the learning experience, such as immersive gameplay, interactive features, and accurate scientific information. Future research should focus on developing and evaluating climate change awareness games that incorporate these features to promote environmental education and behavior.

## CONCLUSION

Climate change is a pressing issue that requires collective efforts to mitigate its adverse impacts on the environment and human lives. Climate change awareness games are effective tools in promoting environmental education and behavior. The games create an immersive learning experience that engages players in a fun and interactive way, leading to increased motivation and retention of information. Key features of effective climate change awareness games include immersive gameplay, interactive features, and accurate scientific information. Future research should focus on developing and evaluating climate change awareness games that incorporate these features to promote environmental education and behavior effectively.

## CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

## REFERENCES

1.  Ahmed, A., & Sutton, M. J. D. (2017). Gamification, serious games, simulations, and immersive learning environments in knowledge management initiatives. World Journal of Science, Technology and Sustainable Development, 14(2/3), 78–83. https://doi.org/10.1108/wjstsd-02-2017-0005

2.  Bulut, D., Samur, Y., &Cömert, Z. (2022). The effect of educational game design process on students' creativity. Smart Learning Environments, 9(1). https://doi.org/10.1186/s40561-022-00188-9.

3.  David Rousell& Amy Cutter-Mackenzie-Knowles (2020).A systematic review of climate change education: giving children and young people a 'voice' and a 'hand' in redressing climate change, Children's Geographies, 18:2, 191-208, https://doi.org/10.1080/14733285.2019.1614532.

4.  Duque, D., & Institute of Electrical and Electronics Engineers. (n.d.). SeGAH 19 : 2019 IEEE 7th International Conference on Serious Games and Applications for Health (SeGAH) : date of conference: 5-7 August 2019 : conference location: Kyoto, Japan.

5.  Filho, W. L., Leal, W., Anabela, F. ·, Azul, M., Brandli, L., Pinar, ·, Özuyar, G., & Wall, T. (n.d.). Encyclopedia of the UN Sustainable Development Goals Series Editor: Climate Action. https://www.springer.com/series/15893

6.  Foltz, A., Williams, C., Gerson, S. A., Reynolds, D. J., Pogoda, S., Begum, T., & Walton, S. P. (2019). Game Developers' Approaches to Communicating Climate Change. Frontiers in Communication, 4. https://doi.org/10.3389/fcomm.2019.00028

7.  Gerber, A., Ulrich, M., Wäger, F. X., Roca-Puigròs, M., Gonçalves, J. S. V., &Wäger, P. (2021). Games on Climate Change: Identifying Development Potentials through Advanced Classification and Game Characteristics Mapping. Sustainability, 13(4), 1997. https://doi.org/10.3390/su13041997.

8.  Kolenatý, M., Kroufek, R., &Činčera, J. (2022). What Triggers Climate Action: The Impact of a Climate Change Education Program on Students' Climate Literacy and Their Willingness to Act. Sustainability (Switzerland), 14(16). https://doi.org/10.3390/su141610365.

9.  Lagman, A.C., Raguro, M.C.F., Solomo, M.V.S., Lalata, JA.P.,Goh, M.L.I., Vicente, H.N. (2022). HWYL: An Edutainment Based Mobile Phone Game Designed to Raise Awareness on Environmental Management. In: Nagar, A.K., Jat, D.S., Marín-Raventós, G., Mishra, D.K. (eds) Intelligent Sustainable Systems. Lecture Notes in Networks and Systems, vol 334. Springer, Singapore. https://doi.org/10.1007/978-981-16-6369-7_43.

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**International Journal of Applied Engineering & Technology**

762

## *International Journal of Applied Engineering & Technology*

10. Lee, J. J., Ceyhan, P., Jordan-Cooley, W., & Sung, W. (2013). GREENIFY: A Real-World Action Game for Climate Change Education. Simulation and Gaming, 44(2–3), 349–365. https://doi.org/10.1177/1046878112470539.

11. Lee, Joey. (2015). Climate change games as tools for education and engagement. Nature Climate Change. 5. 413-418. https://doi.org/10.1038/nclimate2566.

12. Mccallum, I., See, L., Sturn, T., Salk, C., Perger, C., Duerauer, M., Karner, M., Moorthy, I., Domian, D., Schepaschenko, D., & Fritz, S. (2018). Engaging Citizens in Environmental Monitoring via Gaming *. International Journal of Spatial Data Infrastructures Research, 13, 15–23. https://doi.org/10.2902/1725-0463.2018.13.

13. Meya, J.N., Eisenack, K. Effectiveness of gaming for communicating and teaching climate change. Climatic Change 149, 319–333 (2018). https://doi.org/10.1007/s10584-018-2254-7.

14. Mrs. R. P. Dhiyaneshwari,Dr. C. Renuga Devi (2022).Digital games in the classroom: Benefits and Barriers.Conference: Annual International Conference on Multidisciplinary Research and Innovation,29-40.

15. Nicole M. Ardoin, Alison W. Bowers, Estelle Gaillard (2020). Environmental education outcomes for conservation: A systematic review. Biological Conservation,241. https://doi.org/10.1016/j.biocon.2019.108224.

16. Razali, N. E. M., Ramli, R. Z., Mohamed, H., Mat Zin, N. A., Rosdi, F., & Mat Diah, N. (2022). Identifying and validating game design elements in serious game guideline for climate change. Heliyon, 8(1). https://doi.org/10.1016/j.heliyon.2022.e08773

17. Ruf, A., Zahn, C., Agotai, D., Iten, G., &Opwis, K. (2022). Aesthetic design of app interfaces and their impact on secondary students' interest and learning. Computers and Education Open, 3, 100075. https://doi.org/10.1016/J.CAEO.2022.100075.

18. Vasoya, N., & Vansdadiya, R. (2023). Effective Strategies for Promoting Foundational Literacy and Numeracy in Early Childhood Education. *Journal of Social Sciences*, *19*, 92–95. https://doi.org/10.3844/jssp.2023.92.95

19. Yang, H. C., Lee, M. T., & Lin, L. C. (2022). The Application of Game-Based Teaching for Water Resources Science Learning. Applied Sciences (Switzerland), 12(19). https://doi.org/10.3390/app12199920.

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**International Journal of Applied Engineering & Technology**

**763**