

## Innovative Integration of Green Sustainable Development in E-sports

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### Abstract

Integrating elements of green sustainable development (GSD) awareness into e-sports applications presents a unique opportunity to educate and engage youth in environmental sustainability. This study explores the integration of sustainability into the e-sports industry, a critical endeavor given the sector's global reach and environmental impact. Employing a qualitative methodology, the research synthesizes data from academic literature, industry reports, and digital media to identify patterns and best practices for embedding sustainability within e-sports. Utilizing content analysis of leading e-sports applications, the study examines the feasibility and impact of embedding GSD themes within game narratives and mechanics.

Major findings reveal a growing awareness and implementation of eco-friendly practices among e-sports organizations, such as waste reduction and virtual event promotion, alongside innovative game narratives that highlight environmental themes. Additionally, partnerships between e-sports entities and environmental NGOs have amplified sustainability messaging. The study suggests further research into optimizing educational content within games, expanding green practices at events, and leveraging digital influencers to enhance environmental advocacy. By advancing these areas, the e-sports industry can play a pivotal role in promoting global sustainability and fostering environmental consciousness among its diverse audience to promote green sustainable development through digital platforms.

**Keywords:** E-sports, Sport Value, Sustainable Development, Innovation, Digital Platforms.

## **Introduction**

In the digital age, the boundaries of education and awareness constantly keep growing, frequently colliding with entertainment and popular culture in unexpected ways. E-sports is one of this industry's most vibrant and fast rising industries. Traditionally seen as a subset of competitive video gaming, e-sports has grown into a global phenomenon with the potential to effect profound social and environmental transformation. With millions of engaged viewers and players participating in this thriving ecosystem, e-sports provides a unique and strong platform for public awareness and education, particularly in the promotion of green sustainable development. Harnessing the potential of e-sports can result in new solutions to urgent environmental challenges. By incorporating sustainability messaging into games, hosting eco-friendly events, and building relationships with environmental organizations, the e-sports community can inspire and organize a varied audience toward a more sustainable future. The article discusses the varied potential of e-sports as a vehicle for increasing public understanding of sustainability, focusing on the innovative techniques and collaborative efforts that can make a real difference in the global quest for environmental stewardship.

## **The Concept and Development of E-Sports**

Electronic sports or "E-Sports" can be characterized as a professional video game activity that employs the intermediary of electronic equipment combined with internet connectivity to connect with game data and participate at the amateur, semi-professional, and professional levels with multiple world-class competitions. In addition to e-sports, other names with comparable connotations include video games, cyber sports, computer games, and virtual sports. One of the largest e-sports contests, Space Invaders Atari, took place in 1980, with 10,000 competitors in the United States, making it the world's first large-scale video game competition. This Space Invader game was created in 1978 and was one of the most popular at the time. It is playable on arcade machines. (Kane et al 2017). E-sports were highly popular in the early 1990s, and the number of players expanded dramatically over the decade. The term "Electronic Sports" or "e-Sport" dates back to the late 1990s, and one of the first sources to use the term was a 1999 press release announcing the formation of the Online Gamers Association (Abdullah, 2023).

In Malaysia, the growth of e-sports began in the late 1990s, when cyber cafés offered video game programs on their computers. This circumstance successfully attracts video game or e-sports lovers to their facilities on a regular basis. In 2000, Malaysia hosted the World Cyber Games, allowing local talent to compete against top international players. Rinie Ramli won three gold medals for Malaysia and was fourth overall in the world in 2005. Due to the growing

popularity of e-sports, the Electronic Sports Association of Malaysia (ESM) was registered and certified by the Malaysian Sports Commissioner on December 4, 2014 (Abdullah, 2023).

In addition, the Electronic Sports Association of Malaysia (ESM) helped to build the country's first e-sports academy. This academy was established with the goal of developing more national professional players, but it also emphasizes other key parts of e-sports like as event management, team management, coaching, shoutcasting, judging, and others. As caused of the Movement Control Order (MCO) declared in 2020 to combat the spread of the COVID-19 epidemic, the Ministry of Youth and Sports (KBS) and the Electronic Sports Association of Malaysia (ESM) have launched the My E-sports Championship: MyStay@HomeChallenge to identify potential young talent for international competition. The online tournament included 13 states and two federal territories. The event competes in two types of games, Mobile Legends: Bang Bang (MLBB) and Player Unknown's Battlegrounds Mobile (PUBGMobile), in groups of up to 64 teams for MLBB, with 320 players participating in PUBGMobile (Abdullah, 2023).

There are four platforms for playing e-sports games. The first is a personal computer (PC), which can be a desktop or a laptop. Second, through game-specific consoles such as the PlayStation and Xbox. The third platform is handheld games, which are portable gaming consoles that can be carried anywhere, such as the Sony PSP or Nintendo DS. The final platform is Mobile Games, which are games intended to be played on the user's smartphone. In general, e-sports can be split into two categories based on the number of players: individual and group. The second classification is based on the game's genre. Among the most popular genres are strategy genres like as Dota2 and Warcraft, which involve the player's skill to command a team, manage resources, and build a region, where players must focus entirely on making timely decisions in order to outperform their opponents (Abdullah, 2022).

The sports genre is also popular among e-sports players, as it was designed for those who enjoy actual physical sports activities. This genre is based on classic physical sports including football, basketball, archery, and others. Essentially, participants will compete in virtual sports competitions, complete with game infrastructure and real sports legislation, but set in the world of e-sports. Real-world knowledge and expertise will help e-sports players win a competition; programs that use this genre include Pro Evolution Soccer (PES) and Fifa Football. There are many more genres that can be included, and each of these genres has its own fans and followers. Other genres include adventure, combat, shooting, racing, and others (Abdullah, 2022)

### **Methodology**

A method of research is a process for collecting or analyzing data in a study. Research technique is critical to ensuring that the study's findings are consistent with its goals and objectives (Sunawari, 2011). The study adopts a qualitative methodology, with a primary focus on library research. This method entails conducting a thorough study of existing literature, which includes academic journals, books, industry reports, and digital media sources on e-sports and sustainable development. The study's goal is to find patterns, themes, and best practices that demonstrate how sustainability concepts can be effectively integrated into the e-sports business by synthesizing data from a variety of trustworthy sources. The qualitative analysis allows for a thorough examination of both theoretical frameworks and

practical case studies, laying a solid foundation for understanding the promise and challenges of this integration.

Library research in this context also involves examining historical and contemporary perspectives on environmental sustainability within the broader gaming and entertainment sectors. This includes evaluating the initiatives and policies of leading e-sports organizations, as well as the role of technological advancements and community engagement in promoting green practices. By critically analyzing this wealth of information, the study seeks to identify innovative strategies and actionable insights that can guide stakeholders in embedding sustainable development goals into the fabric of e-sports. This methodology not only ensures a thorough and nuanced understanding of the subject but also highlights the transformative potential of e-sports as a vehicle for environmental education and advocacy.

### **Results and Discussions**

A review of the current state of e-sports and its integration with green sustainable development yields several major results. First, the e-sports community is becoming more aware of the importance of sustainability. Major e-sports organizations and tournament organizers are starting to implement eco-friendly techniques like decreasing waste at events and encouraging digital over physical media to reduce the usage of materials. These initiatives indicate an increased awareness of environmental issues among e-sports players and organizers (Hanafiah, 2021).

### **In-Game Environmental Themes**

Lots of developers of games incorporate environmental themes into their narration, providing a unique way to educate players about sustainability. Games such as "Eco" and "Beyond Blue" are good instances of how players may directly engage with environmental issues by managing ecosystems or exploring underwater settings (Ridzuan, 2022). "Eco," created by Strange Loop Games, immerses players in a world where they must balance civilization's requirements with the health of the ecosystem, developing an awareness of sustainable resource management. Similarly, "Beyond Blue," based on BBC's "Blue Planet II," lets players to explore the ocean while learning about marine biology and conservation initiatives.

These games not only entertain, but also teach players the value of environmental care. Integrating sustainability into gaming allows creators to impact players' views and behaviors toward the environment (Yusri, 2024). The narrative-driven approach makes complex environmental issues more approachable and understandable, generating a new generation of environmentally conscious gamers. The features of the game require players to make choices that balance development and environmental effect, exposing them to concepts like as conservation and sustainable utilization of resources. These games show how environmental themes may be smoothly incorporated into gameplay to increase awareness and comprehension of sustainability challenges.

### **Sustainable E-Sports Events**

Notable tournaments, including the Intel Extreme Masters and DreamHack, have begun to include sustainability measures. Recycling measures, the utilization of renewable energy sources, and the promotion of virtual attendance all help to reduce travel-related carbon footprints. The Intel Extreme Masters has collaborated with ESL (Electronic Sports League) to

develop a set of standards aimed at decreasing the environmental effect of their events, such as limiting single-use plastics and encouraging spectators to take public transit. Extreme Masters has implemented initiatives including recycling programs and the usage of renewable energy to power events. DreamHack, one of the largest digital festivals, emphasizes virtual attendance to reduce the carbon footprint associated with travel.

DreamHack, another prominent e-sports event organizer, has also made substantial efforts toward sustainability. They have implemented efforts such as carbon offset schemes and the utilization of renewable energy to power their events. These approaches not only serve to reduce environmental effect, but also set a good example for spectators and other event organizers. By demonstrating their dedication towards sustainability, these events increase awareness and inspire the broader e-sports community to follow suit. E-sports events lessen their own environmental effect while simultaneously raising awareness among attendance and viewers about the value of sustainability (Borneo, 2022).

### **Partnerships with Environmental Organizations**

Collaborations between e-sports entities and environmental non-governmental organisations (NGOs) have increased. To give an instance, Twitch and WWF (World Wildlife Fund) collaborated on Earth Day to create streams dedicated to raising awareness and funding for environmental problems. This collaboration enabled streamers to use their platforms to spread awareness about climate change, wildlife protection, and sustainable living (Hanafiah, 2021).

These collaborations use e-sports' enormous and engaged audiences to increase the reach of environmental messaging. E-sports may gain legitimacy and effect by partnering with renowned environmental organizations. Furthermore, these collaborations can result in the creation of collaborative campaigns and projects that combine the best of both worlds which are the impact of e-sports and the experience of environmental NGOs.

This connection included streams targeted to raising awareness and cash for environmental problems, which reached millions of viewers worldwide. Such collaborations are effective in combining the reach and involvement of e-sports with the experience and reputation of environmental organizations, resulting in powerful campaigns that educate and mobilize the gaming community. These collaborations show how e-sports may be used to advocate for and take action on environmental issues.

### **Community Engagement and Advocacy**

E-sports celebrities and streamers are increasingly leveraging their platforms to promote sustainability. Influencers with huge followings can effectively distribute information about environmental issues and inspire their followers to take action, such as engaging in local clean-ups or adopting more sustainable lifestyles (Borneo, 2022). For example, popular streamer DrLupo has utilized his platform to promote environmental concerns and raise awareness about climate change. In this case, popular streamers have held charity streams and fundraisers for environmental causes, taken part in awareness campaigns, and advocated for sustainable habits such as minimizing plastic use and supporting renewable energy.

These influencers have a significant impact on their audience's attitudes and behaviors. Their endorsements can help make sustainability activities more appealing and accessible to a younger, digitally savvy demographic. By actively promoting eco-friendly behaviors and participating in sustainability projects, e-sports influencers can motivate their fans to make more environmentally responsible decisions in their own life.

This sort of grassroots activism is especially effective because it capitalizes on the personal connection between influencers and their audiences, making sustainability messages more approachable and captivating. By directly connecting with their communities, e-sports influencers can inspire big behavioral changes and contribute to the larger push toward sustainability (Rahman, 2017).

### **Strategy and its Potential Impact on Integrating Green Sustainable Development Into E-Sports**

#### *Educational Content Integration*

Integrating instructional content about sustainability issues into video games can help gamers have a better awareness of environmental challenges. For example, games with objectives or stages that require players to complete conservation activities might simulate real-world environmental concerns. For example, games like "Eco" demand players to properly manage natural resources and make decisions that impact the game's environment. This technique not only gives an immersive gaming experience, but it also teaches players about resource management and environmental care, making it a valuable teaching tool (Hanafiah, 2021).

The effectiveness of this strategy is demonstrated by players' active interaction with content that promotes critical thinking regarding resource management and environmental care. This in-depth experience not only educates gamers, but also raises their understanding of the necessity of sustainability. The study discovered that when players connect with the notion of sustainability in an interesting and relevant setting, they are more inclined to use it in their daily life (Mokhsin, 2021).

This can be proven by a previous incident in Malaysia, in which Malaysians did Palestine solidarity in the Roblox game. According to a video commentary by Indonesian YouTuber Ys Rizqiyyah, Malaysia succeeded in communicating a humanitarian message to the people of the world until it went viral and became a topic of discussion on social media. She believes that young Malaysians have exceptional ideas that can influence the rest of the globe. Cikgu Zyd, a content creator, promoted the game alongside his pals in favor of online solidarity. In the comments section, individuals believe that the students' ingenuity has prompted various parties to become more worried about the Palestinian war problem. The virtual parade went viral, and Malaysia is now well-known around the world. The video gaming platform successfully transmitted a message to people all around the world, and I was moved to witness the seriousness with which young Malaysians raised the topic of Palestine (Kadir, 2023).

To be associated with this, for example, in the PUBG game, which is a match-up game where the goal is to defeat the opponent. As a result, the inclusion of environmental elements in the game is intended to create goals and outcomes that will lead to creative innovation in green sustainable development. In the PUBG game, you can design a tree for each player to protect,

similar to the player's life in the game. If the tree is felled or destroyed, the game ends immediately. So, the goal of caring for trees as the environment is to educate the public that trees are part of the ecosystem that we should all work to protect. Trees cannot be felled at will if they do not have permission or a stated purpose.

Furthermore, there is a game called Fortnite in which the player must cut down a tree and then recycle the wood to build a tower or bridge in the game. Ideally the most important improvement to be aligned with the environmental elements is that each player needs to be aware why they are cutting down a tree. If they cut down trees without any objectives in their mind, penalty may be applied by lowering the gain in rank points for each match played. This means that the number of woods not utilized in a match will have an impact on the rank points at the end of the competition. In this way, the study could influence the feasibility and impact of embedding GSD Themes within game narratives and mechanics.

### **Green Event Practices**

Green methods in e-sports events have the potential to dramatically reduce their environmental impact. Some of the efforts that can be taken include using biodegradable materials, offsetting carbon emissions, and expanding public transportation use. For example, tournaments like the Intel Extreme Masters have begun to employ ecologically friendly materials and promote virtual attendance in order to lessen the carbon footprint of travel (Hanafiah, 2021).

These strategies not only make events more sustainable, but they also establish standards for fans and other industries to follow, fostering a culture of sustainability. These methods reflect the e-sports industry's dedication to environmental sustainability and can serve as a model for future major events. Promoting sustainable practices at e-sports events can encourage beneficial changes in attitudes and behaviors toward sustainability among a larger audience (Ridzuan, 2022).

### **Collaborative Campaigns**

Collaboration with environmental non-governmental organizations (NGOs) can assist reinforce the message of sustainability by reaching out to audiences who may not be aware of environmental issues. For example, Twitch's collaboration with the WWF on Earth Day demonstrates how e-sports may be leveraged to promote awareness and funding for environmental concerns. Collaborations like this not only broaden the accessibility of sustainability messaging, but also lead to effective education and advocacy activities (Mokhsin, 2021).

Collaboration between NGOs and e-sports can lead to successful public education and advocacy initiatives. Environmental messages can be given to a larger audience via popular e-sports platforms, raising awareness and participation in sustainability concerns. Campaigns like these can help raise awareness and action for sustainability among e-sports players and spectators (Hanafiah, 2021).

### **Digital Platforms and Streamers**

The part of streaming platforms and influencers plays an essential part in shaping public opinion and behavior. E-sports influencers with huge followings can utilize their platforms to

promote sustainability and urge responsible conduct. For example, well-known streamers can arrange unique streaming events dedicated to the theme of sustainability, educating viewers about environmental challenges in an exciting and engaging manner while also raising awareness and promoting action (Ridzuan, 2022).

Streamers can engage and excite viewers by holding special streaming events that focus on sustainability problems. This can raise awareness and inspire action in the audience. E-sports influencers can also leverage their notoriety to promote sustainable behavior and reach a larger audience (Hanafiah, 2021).

### **Analysis of Pros and Cons of E-Sports towards Green Sustainable Development**

The main appeal of a game is the enjoyment and satisfaction gained from playing it, which is also the game's main goal. If the game is uninteresting and tedious, gamers will abandon it. The impact of a game is subjective and depends on a variety of elements, including the genres used in an e-sports application. As a result, this activity has both positive and negative consequences for the participants and the community (Abdullah, 2022).

The invention of games also enhances children's psychology, academic performance, and knowledge. With the advancement of technology available on smartphones nowadays, video games are one of the applications that every school student should have on their smartphone. In fact, learning through games is more pleasant and can lower stress compared to traditional methods of learning. Furthermore, the sophistication of mobile communication systems makes playing games more practicable (Nasir, 2022).

E-sports have the potential to boost the player's cognitive function, engage the active mind, and sharpen their eyesight. This e-sports activity requires players to do several quick actions while also thinking quickly about the next action in the game. At the same time, it can generate individuals who can think swiftly and agilely, particularly when confronted with stressful conditions. According to a study conducted at the University of Iowa in the United States, a total of 681 healthy persons aged 50 and over playing a game specially built for the study for 10 hours can delay the process of cognitive decline by up to 7 years in some situations (Abdullah, 2022). Electronic games have both a bad and beneficial impact on youngsters. This beneficial effect is also vital for the development of children's physical, health, and cognitive abilities (Wardhani, 2008).

While from a negative standpoint, this e-sports activity has the potential to cause a player to act aggressively as a result of the influence portrayed in violent genre applications, or to become so engaged in playing that they forget about real life. For example, the effect on youngsters occurs when they are disrupted while playing. They also enjoy misbehaving or teasing their younger siblings by employing violence to make them weep from the agony of the cruel jokes. These aggressive actions are driven when youngsters are appreciated for being more violent and violent acts are committed on a regular basis. Children control violence and witness it in their own eyes, such as killing, kicking, stabbing, and firing. Experience, repetition, and the incentives gained all have an impact on the building of behavior. Games that cause aggressive behavior include Death Race, Mortal Kombat, Doom, and Grand Theft Auto (Abdullah, 2022). In thought, electronic games will have an impact on



children's development in terms of behavior, physicality, addiction, psychology, and socialization (Wardhani, 2008).

The gaming industry is at the cutting edge of technological innovation and cultural influence, with billions of players worldwide. This broad scope creates a unique chance to incorporate Green Sustainable Development (GSD) ideas into gaming narratives and mechanics. Such integration seeks to educate players about sustainability and motivate real-world behavior changes. This study investigates the influence of incorporating GSD themes into games, emphasizing both the positives and potential problems.

### **Pros of Embedding GSD Themes**

There are various advantages to embedding GSD themes that may be seen. The first one is enhanced environmental awareness and education. Integrating GSD themes into games can greatly increase players' awareness and comprehension of environmental issues. Games like "eco" and "beyond blue" have effectively included elements of environmental stewardship, requiring players to manage resources wisely or explore and conserve underwater environments. These games create an interactive learning environment, making complicated environmental ideas more accessible and entertaining. According to a study, players who play ecologically oriented games have higher levels of knowledge and interest in sustainability issues.

Furthermore, behavioral change and real-world impact can be one of positive impact in embedding GSD themes in e-sports game. Games containing GSD themes can impact players' behavior outside of the virtual world. Games that simulate the repercussions of unsustainable practices can motivate players to adopt more sustainable habits in real life. For example, a game that penalizes players for excessive pollution or rewards them for conservation efforts can instill a sense of environmental responsibility. Serious games created for instructional goals can result in beneficial behavior changes among players, such as improved recycling and energy-saving habits.

Beyond that, community building and advocacy can be identified as beneficial properties of incorporating GSD themes. Including GSD themes in games can also develop groups committed to sustainability. Multiplayer games that necessitate cooperation and collaborative problem solving can foster strong, committed communities that extend their efforts into real-world environmental activism. Collaborative events, such as in-game challenges that connect with global sustainability goals, might inspire gamers to get involved in environmental problems.

### **Cons of Embedding GSD Themes**

There are some limitations to embedding GSD themes that can be identified. First is the risk of superficial integration. The negative aspect of incorporating GSD themes in games is the possibility of shallow or tokenistic integration. If sustainability themes are not well integrated into the game's mechanics and narrative, players may regard them as forced or dishonest. This might lead to a lack of engagement and even mistrust about sustainability initiatives. For example, games that integrate GSD features just as an afterthought or for commercial objectives may fail to provide substantial educational benefits. There are studies that warn

against cosmetic integration, highlighting the importance of authentic and well-researched inclusion of environmental topics.

The other issue is balancing education and entertainment that comes from blending instructional information and entertainment to appeal. While the primary purpose of including GSD themes is to teach, games must also be entertaining in order to attract and retain players. Overemphasis on educational components can result in a didactic experience that may not appeal to all players. Developers must strike a balance between teaching important environmental lessons and preserving the engaging, enjoyable qualities that distinguish great games. A study observes that highly informative games risk alienating gamers who choose fun over learning.

Furthermore, Technical and Financial Constraints is also one of some issues that could occur in embedding GSD in e-sports. Creating games with integrated GSD topics can also be technically and financially challenging. Creating sophisticated, immersive settings that truly reflect sustainability concepts necessitates substantial resources. Smaller independent developers may not have the funds or expertise to successfully incorporate these themes. Furthermore, making these games accessible and appealing to a large audience might increase production costs. While there is an increase in demand for ecologically themed games, the required investment can be prohibitively expensive for many producers.

### **Sustainability in The Gaming Industry: Current Practices and Future Directions**

The industry of gaming contributes significantly to global carbon emissions, with an estimated 3.2 billion gamers globally by 2023. Gaming devices and data centers use a lot of energy, and manufacturing gaming hardware and software consumes a lot of natural resources, like metals and minerals. Furthermore, mining and extraction of these minerals may have detrimental social and environmental consequences (Unity Lab, 2023).

E-sports is a diverse social phenomenon that is frequently viewed as a business or economic industry. A recent hot issue in the e-sports sector is sustainability, which has gotten little attention in academics while becoming an integral component of corporate strategy and business models within e-sports. As e-sports evolve, sustainability will become increasingly important for all stakeholders, despite the fact that individual actors in the ecosystem frequently lack sustainability. Sustainability in e-sports has traditionally been focused on industry stability and business growth. As a result, research addressing sustainability in e-sports focuses on the continuity of the industry and its communities, as well as how e-sports should evolve to grow and remain competitive. As a result, it is critical to investigate sustainability in e-sports from new angles, including economic, environmental, and social sustainability. Economic sustainability refers to the more efficient use of resources for economic growth, whereas environmental sustainability refers to the preservation and enhancement of natural support systems and services for current and future generations of living beings (Nyström, 2022).

Green marketing and corporate social responsibility (CSR) have emerged as key ideas that businesses must adopt in today's society, when environmental concerns and social obligations are of the highest priority. Companies utilize a "green marketing" strategy to manufacture and promote goods and services that are ecologically benign and sustainable,

with little to no negative environmental impact. The environmental benefits of products, such as their minimal carbon footprint, energy efficiency, and recyclable nature, are typically highlighted in this marketing strategy. In contrast, corporate social responsibility (CSR) refers to a company's self-initiated projects and actions that have a positive impact on society and the environment (Deshmukh, 2023).

### **E-sports and Social Impact: Leveraging Digital Engagement for Environmental Advocacy**

The simplest description of e-sports is "competitive gaming," yet this is insufficient for describing the area of study. Therefore, "playing games in a competitive manner" must be elaborated. Many games can be played competitively, but that alone is rarely enough to qualify as a sport. e-sports is formally described as an area of athletic activities in which people develop and exercise mental and physical abilities using information and communication technology (Marko Marelić, 2019). The urgency and complexity of environmental concerns necessitate a global perspective and the adoption of approaches and ideas that allow researchers and practitioners to work more closely together on knowledge production and implementation. Further improvements in environmental policy in sports, environmental education, and how discourses impact environmental action are also encouraged. There is an article that demonstrates the possibilities of collaborative projects and opens up new paths for investigating environmental sustainability in the sporting setting (Cury, 2022).

However, as people become increasingly conscious of gaming's environmental impact, there is an increasing attempt to make the business more sustainable. However, as gaming becomes more popular, its environmental impact grows. The industry has the ability to become more sustainable by implementing environmentally responsible practices. The necessity of addressing the gambling industry's environmental impact cannot be emphasized, and progress toward a more sustainable future is critical. Adopting sustainable gaming practices such as decreasing e-waste, promoting energy-efficient devices, and encouraging the usage of digital versions of games can all help to create a more sustainable gaming industry. Adopting sustainable business practices and increasing environmental awareness can help to reduce the industry's environmental effect. It is essential to recognize that the gaming industry's impact on the environment goes beyond carbon emissions (Unity Lab, 2023).

Gamification techniques are increasingly being used in different sectors of the economy and society. Gamification can improve cognitive and emotional skills, including problem-solving, collaboration, and resistance to difficulties, according to research. It can enhance intrinsic motivation, leading to sustained engagement and learning gains. After completing a task unit, it is crucial to consider providing feedback. Gamified activities can provide feedback during (e.g., failure/replay, hints/help) and post-game (e.g., contemplation, watching others play, evaluation of recent activity). Feedback loops and iterative design approaches can help fine-tune gamification aspects. This would ensure that the tactics used are not only pedagogically solid, but also resonate with the requirements and preferences of the end users (Christopoulos, 2023).

Theoretical frameworks for digital activism and community mobilization, focusing on how e-sports platforms and influencers may promote green, sustainable development. The analysis contains instances of previous campaigns and projects in which e-sports groups collaborated

with environmental NGOs or organized sustainability-focused events. It also examines the effect of gamification in educating and persuading players to adopt environmentally responsible practices. By connecting social impact theory with real examples, this paper provides a complete overview of e-sports' potential to raise environmental awareness and action.

### **Conclusion**

The e-sports industry stands at a pivotal moment where it can transcend its entertainment roots to become a catalyst for positive change. By adopting innovative strategies to promote green sustainable development, e-sports can inspire millions to take action for the environment. Integrating sustainability messaging into gaming content, implementing green practices at events, forming partnerships with environmental NGOs, and leveraging the influence of digital platforms and streamers are key strategies that can drive this transformation. These measures not only raise awareness about environmental issues but also engage a diverse audience in meaningful ways, fostering a culture of sustainability within the gaming community and beyond.

As players, fans, and stakeholders unite in this effort, e-sports can become a beacon of hope, demonstrating the power of digital culture to drive real-world impact. The collaborative potential of the e-sports ecosystem, when harnessed for environmental advocacy, showcases the industry's ability to contribute to global sustainability goals. Embracing this potential not only benefits the environment but also enriches the e-sports experience, making it a force for good in the global community. The journey towards green sustainable development in e-sports is an opportunity to redefine the role of digital entertainment, proving that it can be a powerful tool for public awareness and education, and ultimately, a driver of positive environmental change.

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