

A Gamified Green Training System to Boost Small and Medium Enterprises' (SME) Employee Engagement in Sustainability Initiatives

Mithilesh Beedasy., Abdool Qaiyum Mohabuth

Department of Software & Information Systems, University of Mauritius, Reduit, Mauritius

DOI: <https://doi.org/10.51244/IJRSI.2026.1307000196>

Received: 22 July 2026; Accepted: 27 July 2026; Published: 06 August 2026

ABSTRACT

The purpose of this project is to develop a gamified app to educate employees about sustainability and eco-friendly practices. Traditional methods of employee training often failed because of they tend to be only one directional. To solve this issue, the proposed system incorporates gamification features and mechanics such as points, badges, leaderboards, challenges and quizzes to encourage user participation. There is also a learning section which consists of different learning modules such as waste management, energy saving, water saving and sustainable consumption. The application is developed using Flutter, which is suitable for both IOS and Android and Firebase is used as the database because of its real time data management. The mobile application provides structured learning modules about sustainability such waste management, energy saving, water saving and sustainable consumption. User performance is tracked through quizzes and challenges to evaluate knowledge retention and behavioral change. The results of the tests done on the app show that the system works perfectly and that the gamification mechanics used enhances user participation. This concludes that the system may be used by several other organizations for employee training about sustainability and eco-friendly practices.

INTRODUCTION

In the recent years, companies have been feeling the need to integrate sustainability and eco friendly practices in their day-to-day operations. While many have implemented policies about sustainability, the main challenge is to educate and encourage the employees to adopt those practices. Learning methods such as seminars or workshops have proven to be ineffective as they are sometimes only one directional. This is why many companies are switching to gamification to teach their employees. Gamification is a tactic that incorporates game elements into a non-gaming context to boost user engagement and behaviour. Gamification uses game designs and mechanics such as rewards, badges, leaderboards and points to boost participation and make tasks fun and enjoyable. Learning and training become more enjoyable and effective when gamification is used in employee training. In this dissertation, different factors on how gamification helps in employee learning will be looked at and a fully gamified app to apply those factors will be developed.

With the growing need to adopt sustainability and eco-friendly practices, companies feel the pressure to adopt them. If a company do not apply sustainability, they may lose potential investors as many investors today use the ESG (Environmental, Social, Governance) metrics to investigate a company's impact on the environment before investing. One of the main reasons that companies fail to teach about sustainability is because they do not allocate enough time to train their employees as takes a lot of time to teach. Seminars and workshop are also sometimes ineffective as employees sometimes tend to get bored. To address the challenges faced, we need to develop a gamified mobile application to motivate the employees to learn about sustainability. Gamification motivates employees to tackle new challenges to earn points and compare their potential via their ranking in a leaderboard.

LITERATURE REVIEW

Games are a form of structured play or activity done by people for enjoyment or entertainment. Games can include various players, which are assigned different roles, playing together or against each other to complete

goals and challenges for rewards [1]. Games exist in different formats such as serious games which are developed mainly for problem solving instead of entertainment. Serious games help learners gain a good understanding of a specific topic and develop and retain advanced skills over time. Serious games are used in sectors such as Healthcare, Education, marketing and many other industries. A beautiful environment is developed for players to be immersed in the game.[2].

Gamification is a strategy that combines elements that are fun and related to gaming in general into a nongame context to boost user engagement and behaviour. Gamification uses game designs and mechanics such as rewards, badges, leaderboards and points to boost participation and make tasks fun and enjoyable. It also makes dull experiences more engaging for participants [3]. When gamification is properly implemented in education and training, it can boost the motivation and engagement of users and inspire them to change certain behaviour to support learning [4]. Studies have demonstrated that typical lecture materials are often insufficient for effective learning. Researchers have indicated that integrating gamification into a teaching and learning environment, can have positive impact on student learning [5]. Several companies have implemented gamification in employee training. For example Cisco used a game called “Aspire” to train sales executives on social media skills, awarding badges as players advance. Microsoft implemented training modules with points and badges for contact centre agents, resulting in a 12% drop of absenteeism and a 10% increase in call per shifts. Hp developed a gaming narrative where channel partners earn points which can be exchanged for real gifts.[6]

Sustainability in an organisation helps in waste reduction, conserve resources and can also drive success to the company. Many investors today use ESG (Environmental, Social, Governance) metrics to investigate a company’s ethical impact and sustainability practices. They check the carbon footprint of the company, water usage, community development efforts and board diversity [7]. Research has shown that organizations with high ESG ratings have reduced loan and equity cost, and sustainability programs can boost profit by fostering public support.[8]

Before the implementation of E-learning and gamification, employees attended workshops, training sessions or seminars about how to save the Environment. These sessions are often one directional and lack interactive learning elements. This is why employees find sustainability training as a company required task instead of a meaningful professional development opportunity.[9]

After the implementation of E-learning, companies adopted more engaging methods such as e-learning modules and sustainability committees to encourage participation. These initiatives goals were to create a sense of ownership and promote behavioral change among employees. However, without the company giving the employees the chance to apply what they have learned, employees may find it difficult to translate sustainability concepts into real actions.[10]

Gamification mechanics are the guidelines and feedback loops that create a game like experience and encourage user participation. The mechanics consists of badges as a symbol of achievement, leaderboards to rank participants competitively, challenges to apply knowledge learned and points as a reward for player’s action.

Proposed Solution

The proposed solution is a cross platform mobile application for both Android and iOS users to improve the sustainability and eco-friendly behavior of users. The application uses flutter and firebase for the database and hosting. It contains a module of user authentication (registration, login, password reset), modules of interactive learning topics such as saving energy, water and waste management. There are also quizzes where the users gain points. It shows the users’ performance on a visual form and there are daily challenges and awards that will motivate users. Users progress can also be checked through progress bars, there is a leaderboard to show rank and also a user profile with customization of profile information. Admins can access a dashboard to add/modify contents. Notifications will be sent to the users if any module is incomplete to increase user engagement.

The application works in a client-server architecture. The front-end uses flutter, which can run on both the ios and android environments from a single code base. For back-end, Firebase is used which handles the real-time

database, authentication, cloud functions for the notification part. The application is built using a three-tier architecture with (1) a Presentation Layer which includes Flutter-based mobile interface that renders UI components and handles user interactions; (2) Business Logic Layer which manages application workflows, validation rules, and gamification logic and (3) a Data Layer: Firebase services including Firestore database, Authentication, and Cloud Messaging.

Gamification Mechanics Implementation

Points System and Badges conventions were implemented. Users earn points through multiple activities with a weighted scoring system:

Activity	Points Awarded
Learning module completion	50 points per module
Quiz correct answer	10 points per correct answer
Daily challenge completion	30 points per challenge
Consecutive daily login (streak)	20 points bonus per 7-day streak
Module completion bonus	20 points for completing all modules

Badges and Achievements

Nine badges were designed to recognise progressive accomplishments:

Badge Name	Requirement
Green Novice	Complete first learning module
Eco Explorer	Complete two learning modules
Eco Warrior	Complete all four learning modules
Quiz Master	Achieve 90%+ on all quizzes
Streak Champion	Login for 7 consecutive days
Challenge Seeker	Complete 10 daily challenges
Water Saver	Perfect score on water module quiz
Energy Guardian	Perfect score on energy module quiz
Waste Reducer	Perfect score on waste module quiz
Sustainability Guru	Earn all previous badges

Leaderboard

A real-time leaderboard displays user rankings based on total points accumulated. Features include:

- Global ranking among all users
- Display of top 10 users

-
- User's current position and points
 - Refresh on data changes via Firestore real-time listeners

Challenges and Quizzes

- Learning Quizzes: Each module concludes with a 10-question multiple-choice quiz covering module content
- Daily Challenges: Randomly generated 5-question challenges from a pool of 50 questions across sustainability categories
- Immediate Feedback: Each answer is followed by explanatory content reinforcing correct concepts
- Retake Options: Users may retake quizzes to improve scores

Learning Content Structure

Four comprehensive learning modules were developed:

Module 1: Waste Management

- Types of waste (organic, recyclable, hazardous)
- The 3R principle (Reduce, Reuse, Recycle)
- Proper waste segregation techniques
- Organizational waste reduction strategies

Module 2: Energy Conservation

- Understanding energy consumption
- Energy efficiency in office environments
- Equipment management (power-saving modes, shutdown procedures)
- Renewable energy basics

Module 3: Water Conservation

- Global water scarcity context
- Water-saving practices in workplace settings
- Leak detection and reporting
- Water-efficient landscaping and facilities

Module 4: Sustainable Consumption

- Sustainable procurement principles
- Lifecycle thinking in product selection
- Reducing paper and material consumption

- Sustainable transportation options

EVALUATION METHODOLOGY

The evaluation employed a mixed-methods approach combining quantitative metrics and qualitative feedback to comprehensively assess the system's effectiveness. The system performance responded as follows:

Metric	Result
Application launch time	2.3 seconds (average)
Quiz loading time	1.1 seconds
Leaderboard refresh	< 500 ms
Notification delivery	95% delivered within 5 seconds
Crash rate	0.3% across all test devices
Battery usage	< 5% per hour of active use

Knowledge Retention

Knowledge improvement by module was seen to be as follows:

Module	Pre-test Mean	Post-test Mean	Improvement
Waste Management	51%	84%	+33%
Energy Conservation	47%	82%	+35%
Water Conservation	45%	80%	+35%
Sustainable Consumption	43%	77%	+34%

Qualitative Findings

Thematic analysis of qualitative feedback revealed four major themes:

Theme 1: Engagement and Motivation

Participants consistently highlighted the motivational impact of gamification:

"The points and badges made me want to complete all the modules. It felt like a game rather than training." – Participant P2

"I kept checking the leaderboard to see if I could move up. It made me take more quizzes." – Participant P4

Theme 2: Knowledge Accessibility

Users appreciated the structured, accessible content:

"The modules were broken down into small, manageable sections. I could learn during my coffee breaks." – Participant P05

"The infographics made complex topics easy to understand." – Participant P4

Theme 3: Behavioral Influence

Many participants reported practical application:

"I started turning off my computer at lunchtime after learning about energy consumption." – Participant P1

"I've been separating my waste at work and even started doing it at home." – Participant P3

Theme 4: Suggestions for Improvement

Constructive feedback included:

- More advanced content for experienced users (n = 7)
- Team-based challenges (n = 5)
- Integration with workplace sustainability initiatives (n = 4)
- Offline access (n = 3)
- More diverse quiz question types (n = 3)

CONCLUSION

The results provide compelling evidence that gamification effectively addresses the limitations of traditional sustainability training methods. The significant knowledge improvement (71% increase) substantially exceeds typical outcomes of traditional training approaches, which often show minimal long-term retention. Several factors likely contributed to this success. Unlike passive seminars, the gamified approach required users to actively engage with content, answer questions, and apply concepts. This active processing promotes deeper learning and better retention. Quizzes and challenges provided instant feedback, allowing users to correct misconceptions and reinforce correct understanding immediately. This aligns with research demonstrating the importance of timely feedback in learning. Points, badges, and leaderboards created extrinsic motivation that sustained engagement while users developed intrinsic interest in sustainability content. This dual-motivation approach has been shown to be particularly effective in workplace training. The daily challenge format encouraged regular engagement, promoting spaced learning—a technique proven to enhance long-term retention.

REFERENCES

1. D. Eng "What is a Game?" 2024, [Online] Available at: <https://www.universityxp.com/blog/2024/4/16/what-is-a-game>
2. B. Pilote, G. Chiniara., "Serious games" 2019. [Online] Available at: <https://www.sciencedirect.com/topics/engineering/serious-games>
3. S. Kurt, "Gamification, What It Is, How It Works, Examples.," 2023,
4. [online] Available at: <https://educationaltechnology.net/gamification-what-it-is-how-it-works-examples/>
5. A. Bullock, "What are Gamification Features," 2022., [online] Spinify. Available at: <https://spify.com/blog/gamification-features/>
6. S.A. Triantafyllou, C.K. Georgiadis, T. Sapounidis, "Gamification in education and training: A literature review. International Review of Education, 71," 2024., [Online] Available at: https://www.researchgate.net/publication/390860249_Gamification_in_education_and_training_A_literature_review
7. F. Gini et al, "The role and scope of gamification in education: A scientometric literature review" 2025, [Online] Available at: The role and scope of gamification in education: A scientometric literature review - ScienceDirect
8. Central, "Real-life Examples of Gamification at Work". [Online] Available at: <https://central.com/resources/gamification-examples/>

-
9. A. Spiliakos, “What does sustainability mean in business?,” 2018. [Online] Available at: <https://online.hbs.edu/blog/post/what-is-sustainability-in-business>
 10. IBM, “Environmental, Social and Governance (ESG) reporting and sustainability,” 2024. [Online] Available at: <https://www.ibm.com/think/topics/business-sustainability>
 11. L. Genghini, “The 8 Key Reasons Behind Corporate Failure in Engaging Employees in Sustainability” 2024, [Online] Available at: <https://2030.builders/8-key-reasons-behind-corporate-failure-in-engaging-employees-in-sustainability/>