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Review on: E-Learning with Gamification

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ABSTRACT

This study explores how students feel about gamification in e-learning, specifically looking at whether it enhances their motivation, engagement, and perceived quality of learning, ultimately impacting their overall satisfaction. The research follows a two-part process. First, key themes and concepts are identified through an in-depth literature review to create a framework for understanding gamification's effects. Then, a survey tool is developed and distributed online, collecting responses from 409 students. Using Partial Least Square Structural Equation Modeling (PLS-SEM), the study examines how gamification influences learning.

Keywords: *Interactive Learning: Digital Education; Inspiration: Active Participation; Learning Quality: Perceived Fulfillment*

Introduction

Education is increasingly moving towards more sustainable practices, and digitalization plays a vital role in this transition (Fulop et al., 2023; Mashroofa et al., 2023). With the rise of digital technology and the push for remote learning during the COVID-19 pandemic, e-learning has become a central component of modern education (Fulop et al., 2023; Rahayu et al., 2022). This shift has also fueled a establishing e-learning as a practical alternative to traditional in-person learning. Many educational institutions are now embracing e-learning for its affordability and its flexibility, which supports independent learning (Gupta & Priyanka, 2022; Hossein Oost et al., 2022).

Reports project the global e-learning market will reach $0 billion by 2028, growing at an annual rate of approximately 9% (Statista, 2023). Beyond education, companies are adopting e-learning for employee training and development as well. However, one significant challenge remains: the low course completion rates, which typically fall between 5% and 15% (Khaldi et al., 2023; Vos, 2023). This issue highlights the need for new success in e-learning environments.

Gunasekaran et al.(2002) define-learning as a form of online education that integrates crucial rudiments like course design, content delivery, operation systems, and fostering a sense of community among learners. E-learning offers scholars flexible, quick access to information (Sandrone & Carlson, 2021). still, while live online sessions and virtual meetings can originally capture scholars' interest, maintaining harmonious provocation throughout a course remains a challenge (Lowenthal et al., 2014). Issues like delayed feedback, internet dislocations, limited faculty support, and a sense of social insulation can hamper the overall eLearning experience, especially due to reduced commerce with peers and preceptors (Abaidoo & Arkorful, 2014; Fulop et al., 2023; Hassan et al., 2021; Hossein Oost et al., 2022).

Come an decreasingly favored system within learning (Aguilos et al., 2022; Behl et al., 2022). Gamification involves adding game- suchlike features similar as points, situations, colophons, and prices to the literacy terrain to make it more engaging (Strmecki et al., 2015). When incorporated into assessments, these rudiments can produce a positive sense of competition, motivating scholars to stay laboriously engaged (Rahayu et al., 2022; Smiderle et al., 2020; Sousa- Vieira et al., 2021). Pleasurable aspects, gamification enhances the literacy experience, making it more dynamic and satisfying (Gupta & Priyanka, 2022; Rahayu et al., 2022). still, some walls remain. Gamification can feel complex to apply, and there's still dubitation around its factual effectiveness, along with limited mindfulness of its benefits.

Literature Survey

E-learning systems have seen a rapid increase in users, driven by significant advancements in computer technology. Many educational institutions are adopting these systems, recognizing their crucial role in promoting sustainable higher education (Mashroofa et al., 2023). E-learning can be defined as the use of information and communication technologies (ICT) to enhance learning quality by providing resources and services that facilitate communication and collaboration in educational settings (Liu et al., 2022). The terms open learning, distance learning, web-based learning, and online

learning are often used interchangeably to describe e-learning (Liu & Yu, 2023). [1]

Compared to traditional learning, e-learning offers several advantages, such as immediate feedback, the creation of social communities, and enhanced student motivation, all while being cost-effective and promoting independent learning (Gupta & Priyanka, 2022; Hossein Oost et al., 2022; Lade & Patil, 2021). Despite these benefits, e-learning can also have drawbacks. [2]

Deterding et al. Deterding et al. (2011) describe gamification as the integration of game-like features and principles into non-game environments. Key gamified components such as badges, leaderboards, rankings, and reward points have been shown to play an important role in eLearning systems (Sandrone & Carlson, 2021; Sousa-Vieira et al., 2021). These elements are crucial in boosting student engagement and fostering positive competition (Bouchrika et al.,
2021; Garcia-Iruela & Hijón-Neira, 2020; Rahayu et al., 2022). [3]

From a determinant's perspective, key variables such as motivation to learn, perceived usefulness, ease of use, learner interaction, satisfaction, and engagement are frequently cited as the most eLearning platforms (Adeshola & Agoyi, 2022; Gupta & Priyanka, 2022; Sandrone & Carlson, 2021; Q. Yu, 2022). Further research has highlighted the importance of quality dimensions, such as the perceived quality of learning in a specific course, course design, and student interaction, in enhancing satisfaction and encouraging further use of e-learning systems (Alkhawaja et al., 2022; Cheng, 2020; Rohan et al., 2021; She et al., 2021; Q. Yu, 2022). [4] Since gamified e-learning platforms are relatively new, current studies are primarily focused on these systems and their impact on various e-learning parameters (Aguilos et al., 2022). E-learning systems are often seen as complex processes that involve more than just following a predefined instructional design model (Almaiah et al., 2020). The introduction of gamification can add further complexity to this process. Therefore, it is essential to understand the attitudes and perceptions toward gamification and e-learning systems (Gupta & Priyanka, 2022; Rahayu et al., 2022). Additionally, during the early stages of adoption, understanding the key factors that influence engagement and perceived satisfaction becomes even more critical (Cheng, 2020; Lobos et al., 2021; Raharjo et al., 2021). [5]

Studies have consistently shown that while the number of course registrations in e-learning is on the rise, the completion rates remain alarmingly low (Hassan et al., 2021). Traditional e-learning systems, with their constant delivery of content and limited interaction, often lead to lower student participation, engagement, and motivation, hindering collaborative learning (Hassan et al., 2021; Rahayu et al., 2022). To address these challenges, the integration of game elements into eLearning has become increasingly popular. Gamification helps to make learning more engaging, motivating, and enjoyable (Mollick & Rothbard, 2014; Strmecki et al., 2015). It also positively impacts students' perceptions of their own abilities and their overall satisfaction with the learning experience (Abaidoo & Arkorful, 2014; Legaki et al., 2021).[6]

Problem Statement

The aim of this project is to design and implement a gamified e-learning platform that utilizes game design elements to enhance student engagement and motivation. By fostering more interactive and seeks to overcome common challenges in digital education, such as lack of motivation and inconsistent engagement, while improving educational outcomes across diverse learning contexts.

Methodology

This study follows a deductive research approach, employing a quantitative methodology to examine the proposed hypotheses. A cross-sectional design was chosen, meaning data was gathered at a single point in time rather than through ongoing collection (as in a longitudinal study). Data collection was conducted using a self-administered online survey questionnaire.

The survey instrument comprised a 5-point Likert scale questionnaire, including 25 items focused on gamification and e-learning systems, along with five demographic questions. These items prior research, as shown in Table 1.

To ensure the instrument's validity, a two-step validation process was conducted. Initially, the survey underwent content validation with five academic experts specializing in gamification, who reviewed the items and provided feedback. Based on their input, minor adjustments were made to improve clarity and relevance. To further ensure ease of comprehension, the revised survey was then tested with five students, who evaluated its clarity and response ease.

Modules Used in the Project Gamification Module:

• Importance: This is the central feature of your system, driving user engagement and enhancing the learning experience through points, badges, leaderboards, and challenges.

• Features:

- Award points for course completion, quizzes, and challenges.
- Display leaderboards to show top performing students.

Course Management Module:

• Importance: Essential for creating, organizing, and managing courses and learning content. This is the backbone of your educational platform. • Features:

- Admin can add, modify, and delete courses.
- Support for multimedia content (videos, documents, etc.).

User Authentication and Authorization Module:

• Importance: Ensures the security of the platform and user data. It allows only authorized users to access the appropriate features and content.

• Features:

- User login and registration.
- Password recovery and user management.

Progress Tracking and Analytics Module:

• Importance: Tracks and monitors the student's progress throughout the course. This helps in personalizing the learning experience and rewarding progress.

• Features:

- Multiple types of questions (MCQ, true/false, etc.).
- Auto-grading of quizzes and instant feedback.
- Track scores and achievements for rewards.

Algorithm

Sorting Algorithm for Leaderboards and User Rankings:

It sorts users based on their scores in descending order to display a leaderboard. This is commonly used in gamified systems to highlight top performers. Using PHP's sort () function, the algorithm compares the scores of users and orders them from highest to lowest. The sorting logic involves defining a custom comparison function that subtracts the scores of two users, ensuring that higher scores come first.

Search Algorithm for Course and Content Recommendations:

The Search Algorithm for Course and Content Recommendations filters courses based on a user's search keyword, helping to suggest relevant content. It uses PHP's array_filter() function to match the user's search input with course titles.

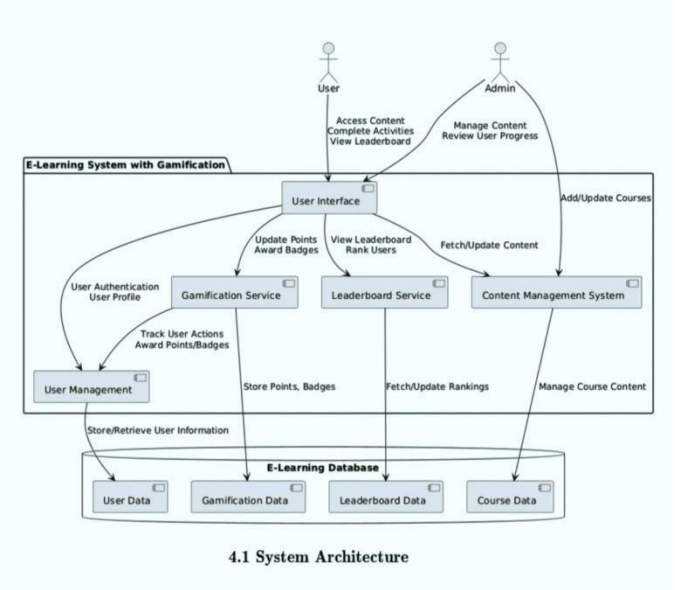
User Engagement and Rewarding Algorithm:

The User Engagement and Rewarding Algorithm calculates and updates user points based on their actions (such as completing modules, passing quizzes, or earning badges). This motivates users engagement.

Gamification Logic Algorithm for Points, Badges, and Challenges:

The Gamification Logic Algorithm for Points, Badges, and Challenges rewards users with badges and unlocks challenges based on their accumulated points and achievements. It motivates continued user engagement by giving tangible rewards for progress.

System Architecture



4.1 System Architecture

Conclusion

The research explored how gamification in eLearning influences learning parameters like motivation to learn, learning quality, and student engagement and examined how these factors contribute to perceived satisfaction. Through a survey of 409 responses, analyzed using partial least squares-based structural equation modeling

(PLS-SEM), the study revealed that gamification positively influences motivation and learning quality. However, the impact on student

Interestingly, learning quality emerged as a critical mediator between gamification and perceived satisfaction. Student engagement was identified as a key factor for increasing perceived satisfaction, emphasizing its importance in e-learning platforms.

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