
AN INVESTIGATION INTO STUDENT PERCEPTIONS: THE GAMIFICATION OF E-LEARNING SYSTEMS

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ABSTRACT

Gamification, the integration of game design elements into non-game situations, has emerged as a powerful approach to enhance motivation, engagement, and overall user experience. In the realm of eLearning, gamification involves incorporating game elements like points, badges, leader boards, and rewards to create interactive and immersive learning experiences. This study adopts a quantitative cross-sectional design to explore students' perceptions of gamification in eLearning. Data collection involves a Likert-style questionnaire covering dimensions such as gamified learning, performance expectancy, effort expectancy, social influence, facilitating conditions, eLearning system use, and user satisfaction. The primary objective is to investigate how students perceive gamification in eLearning. The study includes the development of a gamification-based Learning Management System named Learning Zone LMS on Moodle and assesses its impact on students' perceptions and engagement. The course design incorporates gamified elements to promote engagement among participants. The study collected users' perceptions of gamification from 192 participants across diverse academic disciplines. Descriptive analysis revealed positive perceptions in all aspects, with high expectations for positive impacts on academic performance and user satisfaction. Overall, participants expressed satisfaction and positive perceptions

of gamified eLearning, highlighting the effectiveness of gamification in creating dynamic and effective learning experiences for learners.

KEYWORDS

Gamification, eLearning, gamified learning, gamification of eLearning, user perception, Moodle

INTRODUCTION

Instruction delivered on a digital device that is intended to support learning is known as eLearning (Aldiab, Chowdhury, Kootsookos, & Alam, 2017). eLearning is a learning method that uses Information and Communication Technology (ICT) to convey information/material for education. ICTs are a diverse set of technologies, tools, and resources used to communicate, create, broadcast, store, and manage information (Manpreet Kaur, 2021). ICTs in education facilitate the delivery of instructions and enhance the learning process. ICTs also support personalized learning which serves students with diverse needs.

Gamification is the integration of game design elements in a context other than games (Deterding, Dixon, Khaled, & Nacke, 2011). Gamification has gained considerable attention in the field of education, particularly in eLearning settings. As eLearning continues to expand as a prominent mode of education, understanding users' perceptions of gamification becomes essential for optimizing its effectiveness and appeal (Hamari, Koivisto, & Sarsa, 2014). This study aims to investigate how learners perceive and interact with gamified learning environments in eLearning systems (Landers, Bauer, Callan, & Armstrong, 2015).

This research is focused on understanding users' perceptions of integrating gamification elements within eLearning platforms. The study explores dimensions such as gamified learning, performance expectancy, effort expectancy, social influence, facilitating conditions, eLearning system use, and user satisfaction to gain valuable insights into the acceptance and influence of gamification in educational settings. The motivation behind this research arises from the need to enhance learner engagement and motivation in eLearning. Gamification offers the potential to create interactive and enjoyable learning experiences, which can positively impact knowledge retention and overall learning outcomes. Prioritizing users' perceptions is essential as it directly impacts their engagement, motivation, acceptance, learning outcomes, satisfaction, and retention. Positive perceptions can lead to higher interest and enthusiasm, encouraging users to embrace technology, ultimately resulting in an improved overall learning experience. Valuable insights into users' perspectives enable continuous improvement and personalized design, driving ongoing innovation to effectively meet learners' needs.

This study holds significant value as it contributes to the evolving field of gamified eLearning by comprehensively exploring user perceptions. The research offers valuable implications for designing and implementing effective and engaging digital learning platforms, with findings that can aid in developing learner-centered strategies and enhancing overall eLearning experiences. Specifically, the study addresses the optimization of learner engagement and motivation through the exploration of user perceptions of gamification in eLearning systems. Its importance lies in guiding educators and designers to create more effective and enjoyable eLearning environments by prioritizing users' perceptions. By gaining a thorough understanding of users' perspectives on gamified eLearning, they can optimize eLearning experiences and foster learner motivation, thereby significantly benefiting learners' academic journey.

LITERATURE REVIEW

E-Learning

The concept of eLearning arose in the early twentieth century with the use of audio-video communication for remote or distance learning. This was further expanded in the 1980s when the use of computers became more prevalent in delivering learning materials and in some sort of assessment. Teaching through the Internet first appeared in the 1990s, allowing for more advanced lesson delivery, drill and practice programmes, and more personalized training (Abby Fry, 2022).

eLearning is recognized as a more effective learning mode compared to traditional methods due to its flexibility in time and place. It empowers students to choose when and where they study, enhancing accessibility and removing barriers to participation. By fostering interactions through discussion forums, eLearning promotes collaboration and respect for diverse perspectives. Moreover, it facilitates communication and relationship-building between students and instructors. Additionally, eLearning proves cost-effective by eliminating the need for travel and extensive infrastructure. Individual learning preferences are accommodated, allowing learners to focus on specific areas of interest. Furthermore, eLearning addresses academic staff shortages and enables self-pacing, reducing stress and increasing satisfaction for learners

Gamification

Gamification is the use of game design components such as points, badges, leaderboards, and challenges to engage and inspire participants in non-game situations (Deterding et al., 2011). Although the term "gamification" became popular in the early 2010s, its conceptual roots may be traced back to the early 2000s, when researchers began investigating the possibilities of gaming components in educational settings. Gamification originated as a means of leveraging games' characteristic motivational

and engaging features and applying them to real-world circumstances. Gamification seeks to improve motivation, engagement, and overall user experience by introducing game components such as goals, feedback, and rewards into non-game tasks

Gamification in eLearning

Gamification in eLearning refers to the planned integration of game elements, such as points, badges, leaderboards, and rewards, into online educational activities to enhance learner engagement and motivation (Deterding et al., 2011). By applying game design principles to the learning environment, gamification aims to make the educational experience more interactive, enjoyable, and immersive, thereby fostering active participation and increased motivation among learners. By incorporating gamification into eLearning, the following benefits are aimed to achieve.

Enhanced Engagement

Gamification techniques have been found to captivate learners' attention, stimulate their curiosity, and promote active participation in the learning process (Hamari et al., 2014). By incorporating game elements, such as narratives, quests, and challenges, eLearning becomes more interactive and immersive, increasing learners' engagement with the educational content.

Motivation and Persistence

Gamification in eLearning has been shown to enhance learners' intrinsic motivation by providing them with a sense of autonomy, competence, and relatedness (Hamari et al., 2014). Through the introduction of game elements like achievements, progress tracking, and rewards, learners are motivated to persist in their learning journey, overcoming obstacles and achieving a sense of accomplishment.

Improved Learning Outcomes

Gamified Learning environments have demonstrated positive effects on learning outcomes. Research has shown that gamification can improve knowledge retention, promote skill development, and enhance critical thinking and problem-solving abilities among learners (Kapp, 2012). By providing interactive and challenging learning experiences, gamification facilitates active learning and the application of knowledge in practical contexts.

RESEARCH OBJECTIVE

1. To explore the perception of students regarding the gamification of the e-learning system

RESEARCH QUESTION

1. What are the perceptions of the students about the gamification of e-learning using

Moodle learning management system?

RESEARCH METHODOLOGY

The study adopts a quantitative cross-sectional design to explore students' perceptions of gamification in eLearning. Data collection involves a Likert-style questionnaire covering dimensions like gamified learning, performance expectancy, effort expectancy, social influence, facilitating conditions, eLearning system use, and user satisfaction. The Likert scale allows participants to express their agreement or disagreement, providing numerical data for statistical analysis and a comprehensive understanding of perceptions. The primary objective is to investigate how students perceive gamification in eLearning. The study includes the development of a gamification-based LMS named LearningZone LMS on Moodle and assesses its impact on students' perceptions and engagement. The rigorous approach aims to provide valuable insights for educational practice and future research.

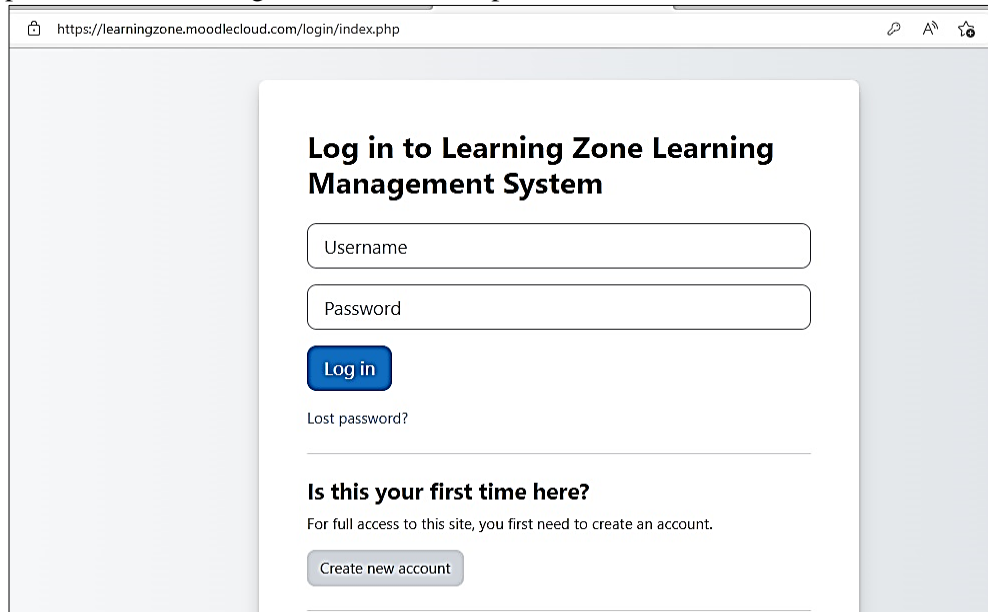


Figure 1: The Learning Zone LMS Login Page

Gamification of the eLearning System

The implementation of gamification of the eLearning system took place within the departments of Computer Science, and Education at the University of Turbat during the Spring 2023 Semester, and in an affiliated college in Turbat during the academic year 2022-23 in Balochistan, Pakistan.

Course Design

The study selected the Introduction of Computing course from the chosen domains as the subject for investigation. All the students enrolled in this course were selected to form the sample for the study. The course was designed to provide a suitable and accessible learning experience, particularly tailored for students who were new to this type of educational setup. Before the study commenced, the participants received brief and comprehensive training on how to effectively engage with the course materials and utilize the eLearning platform. Additionally, continuous technical support was made available throughout the course, ensuring that participants had assistance whenever needed.

Course Contents

i) Calendar & Announcement

The scheduling of classes and other related activities in the eLearning course was facilitated through the utilization of the Calendar activity within the Learning Zone LMS. Additionally, the Announcements activity enabled the users to effectively communicate important announcements to the participants. By actively engaging with the Calendar and Announcements activities, participants could stay updated and ensure their continued involvement in the course.

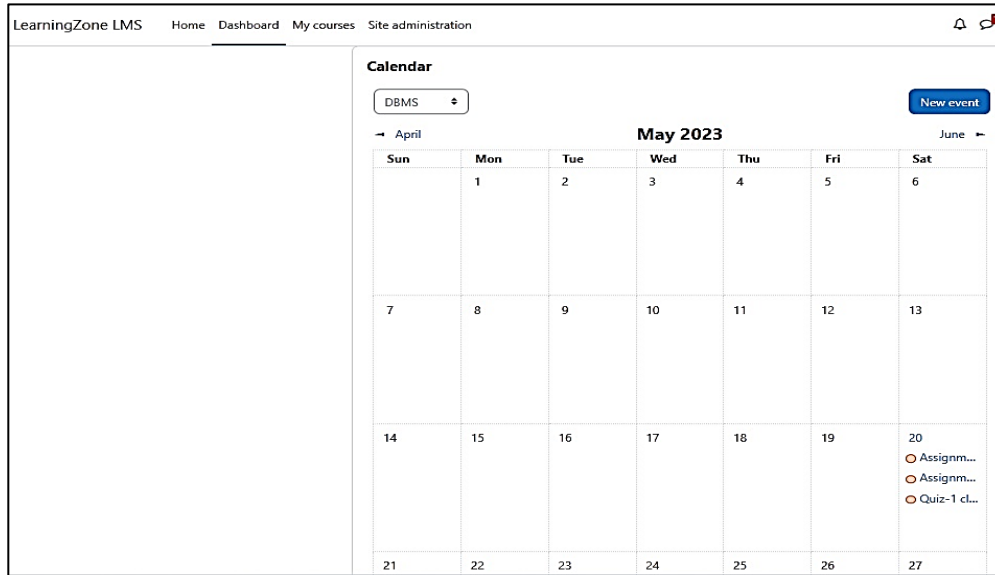


Figure 2: Calendar Feature in the LMS

Once the course commenced, participants were instructed to actively view these features regularly. This practice aimed to keep participants informed about the course schedule, upcoming events, and any relevant updates.

ii) Course Resources

To ensure the convenience of the participants, essential resources for the course, such as recommended books in PDF format, instructional videos, and lecture slides, were incorporated into the course materials. These resources were carefully selected to provide a comprehensive foundation of knowledge and support the participants' learning process.

The screenshot displays the LearningZone LMS interface. At the top, the navigation bar includes 'LearningZone LMS', 'Home', 'Dashboard', 'My courses', and 'Site administration'. On the right, there are icons for notifications, a user profile, and progress bars for 'Users' and 'Storage'. The main content area is titled 'Introduction to Computing' and includes sub-navigation for 'Course', 'Settings', 'Participants', 'Grades', 'Reports', and 'More'. A sidebar on the left lists course items: 'Database Management Sy...', 'Access Database Design & P...', 'Introduction to DBMS-Videos', 'Lecture PPT', 'Assignment-1', 'Quiz-1', 'ITC Discussion Forum', and five 'Topic' sections. The main content area shows a section titled 'Database Management Systems' with a 'Collapse all' button. Below this, three resource cards are displayed, each with a blue icon, a title, and a 'To do: View' button: 'Access Database Design & Programming-Book', 'Introduction to DBMS-Videos', and 'Lecture PPT'.

Figure 3: Resources in the LMS

By including these resources within the course, participants were granted easy access to valuable materials that could supplement their understanding of the subject matter.

iii) Course Activities

The LMS was enriched with purposeful activities to enhance the online learning experience. These activities catered to various aspects of the learning process, promoting engagement, communication, collaboration, and assessment.

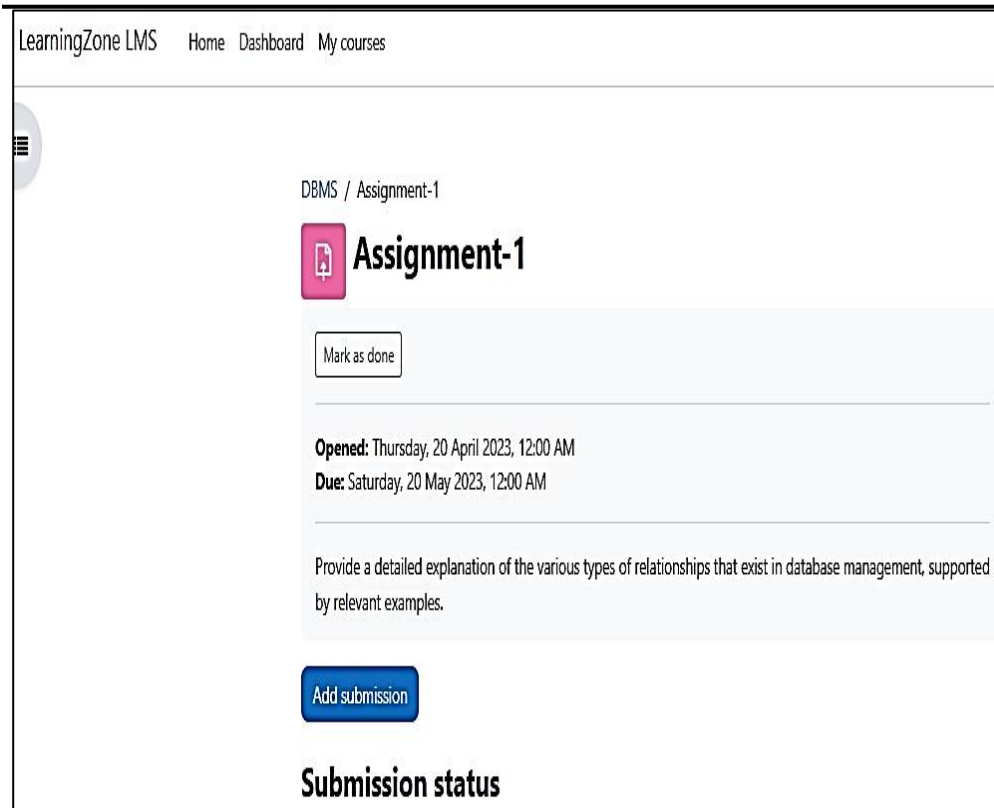
The screenshot displays the LearningZone LMS interface. At the top, there are navigation links: Home, Dashboard, My courses, and Site administration. On the right, there are status indicators for Users and Storage, along with a user profile icon. The left sidebar contains a list of activities under the heading 'Database Management Sy...'. The 'Quiz-1' activity is selected and highlighted in blue. The main content area shows three activity cards:

- Assignment-1:** Includes a 'Mark as done' button. Details: Opened: Thursday, 20 April 2023, 12:00 AM; Due: Saturday, 20 May 2023, 12:00 AM.
- Quiz-1:** Includes a 'Done: View' button. Details: Opened: Saturday, 15 April 2023, 12:00 AM; Closes: Saturday, 20 May 2023, 12:56 AM. It also shows 'To do: Receive a grade' and 'To do: Receive a passing grade'.
- ITC Discussion Forum:** Includes a 'Done: View' button. Details: Due: Sunday, 1 January 2023, 12:52 PM.

Figure 4: Activities in the LMS

The integration of the activities empowered students to take ownership of their learning journey. The LMS provided an inclusive virtual learning environment that facilitated the acquisition and application of knowledge. By promoting active engagement, effective communication, and assessment, the LMS offered a comprehensive platform for students to actively participate and succeed academically.

The assignment activity in the Learning Zone LMS was designed to provide a structured platform for students to access assignment instructions, electronically submit their assignments, and receive feedback from instructors. Clear guidelines and deadlines were communicated within the assignment activity to ensure students' understanding of the assignment requirements and expectations.

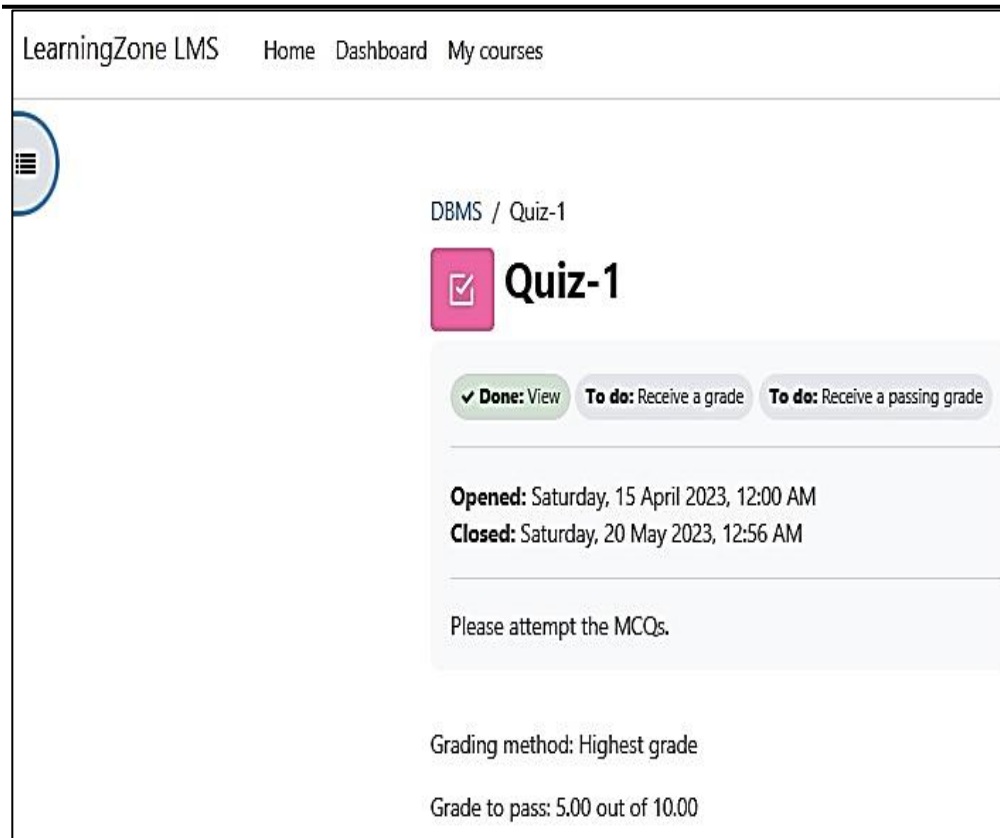


The screenshot displays the LearningZone LMS interface. At the top, there is a navigation bar with 'LearningZone LMS', 'Home', 'Dashboard', and 'My courses'. Below this, a sidebar menu is visible on the left. The main content area shows the breadcrumb 'DBMS / Assignment-1' and a large pink icon with a document symbol next to the title 'Assignment-1'. A 'Mark as done' button is located below the title. The assignment details include 'Opened: Thursday, 20 April 2023, 12:00 AM' and 'Due: Saturday, 20 May 2023, 12:00 AM'. The assignment description reads: 'Provide a detailed explanation of the various types of relationships that exist in database management, supported by relevant examples.' A blue 'Add submission' button is positioned below the description. At the bottom of the page, the section 'Submission status' is partially visible.

Figure 5: Assignment Activity in the LMS

The assessment and evaluation of the submitted assignments within the Learning Zone LMS prioritized offering constructive feedback to support students' academic development. The assignment activity was specifically designed to streamline the assignment workflow, fostering effective communication between instructors and students. In addition, it facilitated efficient grading processes, ensuring prompt notification of grades to students.

The quiz activity in the LMS was implemented to assess students' understanding, promote engagement, and facilitate self-assessment. It allowed instructors to evaluate knowledge retention and adjust teaching strategies as needed. Quizzes encouraged active learning, critical thinking, and problem-solving skills. The immediate feedback provided by the LMS enabled students to identify strengths and weaknesses, guiding their study efforts. The automated grading feature streamlined the assessment process, saving time for instructors and ensuring timely feedback for students.



The screenshot displays the LearningZone LMS interface. At the top, there are navigation links for 'Home', 'Dashboard', and 'My courses'. The main content area shows a quiz titled 'Quiz-1' under the course 'DBMS'. A pink icon with a checkmark is next to the title. Below the title, there are three buttons: 'Done: View' (with a checkmark), 'To do: Receive a grade', and 'To do: Receive a passing grade'. The quiz is marked as 'Opened: Saturday, 15 April 2023, 12:00 AM' and 'Closed: Saturday, 20 May 2023, 12:56 AM'. A message states 'Please attempt the MCQs.' At the bottom, the grading method is 'Highest grade' and the grade to pass is '5.00 out of 10.00'.

Figure 6: Quiz Activity in the LMS

The integration of the forum activity in the Learning Zone LMS was intended to promote effective communication, collaboration, and critical thinking among both students and instructors. By providing a dedicated space for discussions, questions, and knowledge sharing, the forum activity facilitated an interactive learning environment that encouraged active participation. The asynchronous nature of the forum allowed students to engage at their convenience, promoting flexibility and accessibility. Additionally, the forum served as a valuable tool for instructors to clarify concepts, and share relevant resources, enhancing the overall learning experience.

LearningZone LMS Home Dashboard My courses Site administration

DBMS / ITC Discussion Forum

ITC Discussion Forum

Forum Settings Advanced grading Subscriptions Reports More

Done: View

Due: Sunday, 1 January 2023, 12:52 PM

Search forums Add discussion topic Subscribe to forum

Grade users

Discussion	Started by	Last post	Replies	Subscribe
☆ Intro to DBMS	Jamil Ahmed 13 May 2023	Deleted u... 17 May 2023	14	☑

Figure 7: Forum Activity in the LMS

Gamification Strategies

Moodle, a widely recognized learning management system, has gained popularity for its ability to support gamification strategies. This study sought to implement gamification within the Moodle-based LMS by incorporating various elements such as points, grades, badges, and the leader board into the courses. The integration of these gamification elements aimed to enhance the overall learning experience and promote greater engagement among the participants.

To acknowledge and incentivize students' achievements and progress throughout the course, a points-based system was implemented. The accumulation of points was facilitated through two key components: the Quiz activity and active participation in forum discussions. In the Quiz activity, points were automatically awarded based on the accuracy of students' answers. Within the forum discussions, participants had the opportunity to earn points through various means, including recognition by the instructor or peers for their valuable contributions, thoughtful responses, and engagement in meaningful exchanges.

LearningZone LMS														Home	Dashboard	My courses	Site administration	Users	Storage	Edit mod
First name / Last name	ID number	Email address	State	Started on	Completed	Time taken	Grade/10.00	Q. 1 /1.00	Q. 2 /1.00	Q. 3 /1.00	Q. 4 /1.00	Q. 5 /1.00	Q. 6 /1.00	Q. 7 /1.00						
<input type="checkbox"/> sobia baloch Review attempt		balochsobiabaloch@gmail.com	Finished	19 May 2023 1:04 PM	19 May 2023 1:06 PM	2 mins 17 secs	10.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00						
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<input type="checkbox"/> hajira murad Review attempt		hajiramurad112233@gmail.com	Finished	19 May 2023 1:21 PM	19 May 2023 1:23 PM	1 min 58 secs	10.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00						
<input type="checkbox"/> sana afzal Review attempt		sanaafzal6616@gmail.com	Finished	19 May 2023 1:22 PM	19 May 2023 1:25 PM	2 mins 53 secs	10.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00						
<input type="checkbox"/> hasham habib Review attempt		hashamhabib67@gmail.com	Finished	19 May 2023 1:25 PM	19 May 2023 1:26 PM	1 min 47 secs	10.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00						
<input type="checkbox"/> jamal ahmed Review		sa2434016@gmail.com	Finished	19 May 2023 1:26	19 May 2023 1:28	2 mins 3	10.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00	✓ 1.00						

Figure 8: Quiz Points in the LMS

The points system served as a tangible representation of students' accomplishments, providing them with a sense of achievement and motivation to actively participate in both quizzes and forum discussions.

Grades were utilized as an assessment tool to evaluate students' performance, offering valuable feedback and facilitating their understanding of their progress and areas of improvement. This evaluation process involved a thorough assessment of the assignments based on predefined criteria and standards. The teacher utilized their expertise and subject knowledge to objectively evaluate the quality, accuracy, and completeness of the assignments, ensuring fairness and consistency in the grading process.

Submission

Submitted for grading
 Graded
 Assignment was submitted 12 hours 35 mins early
 Student can edit this submission

+ (158 words)
 programming languages are categorized into two types
 the low level language and high level languages
 the low level language includes ...

▶ Comments (0)

Grade

Grade
 Grade out of 10

7.00

Current grade in gradebook
 7.00

Figure 9: Grading of Assignment in the LMS

The assigned grades served as an objective measure of the student's performance, allowing them to gauge their progress and academic achievement in the course. The teacher's involvement in the grading of assignments contributed to maintaining academic rigor and upholding the established educational standards, ultimately supporting the student's learning and academic growth.

Badges served as visual markers to recognize and highlight students' achievements and important milestones, serving as additional incentives for active participation. The incorporation of badges within the learning management system aimed to provide automatic recognition and rewards to participants upon the completion of specific tasks. By tracking participants' progress, the system identified when the required tasks were accomplished and automatically granted the corresponding badges. This automated process ensured an efficient and accurate acknowledgment of participants' achievements.

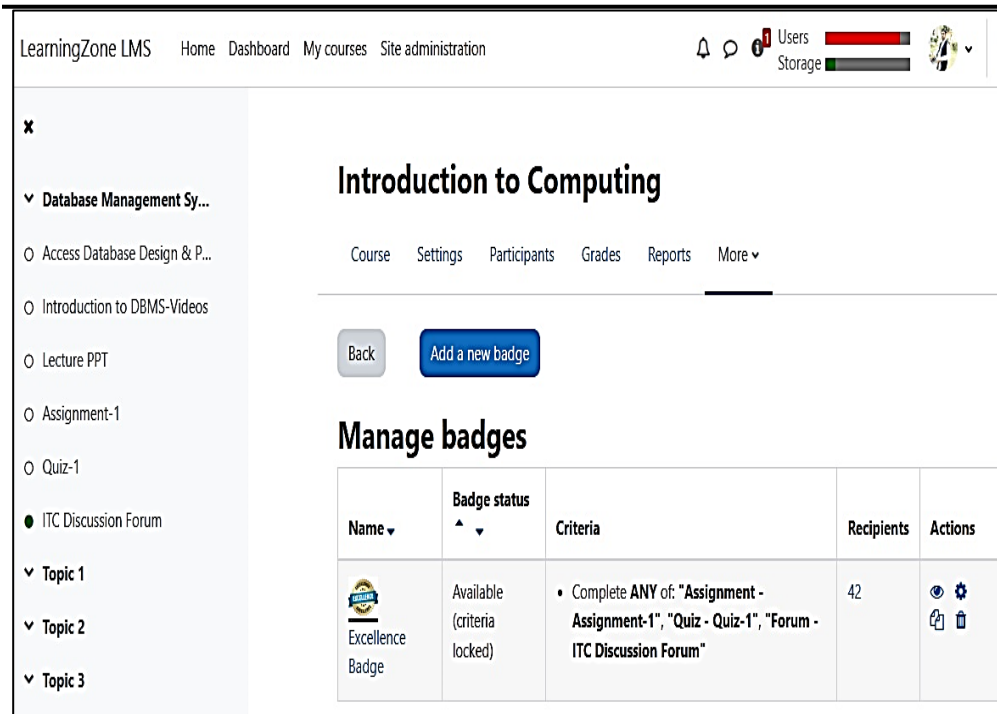


Figure 10: Badge in the LMS

The badges, acting as visual representations of accomplishments, not only acknowledged participants' efforts but also motivated them by instilling a sense of accomplishment and encouraging continued engagement and advancement in the learning activities.

Additionally, the leader board feature allowed both learners and instructors to access a comprehensive overview of students' performance, facilitating progress tracking and identifying areas for development. The leader board functionality within the LMS was utilized to effectively record and manage the points and grades of participants. It served as a centralized tool to collect and present the assessment outcomes, offering a comprehensive overview of participants' progress and academic performance throughout the course. The leader board was configured to be accessible to participants, allowing them to view their grades and track their performance over time. This transparent approach not only facilitated self-assessment but also encouraged participants to take responsibility for their learning.

Instrument

After participation in the gamified eLearning course, a well-structured questionnaire was utilized to gather the feedback of students regarding their experience with the implementation of Gamified Learning. The questionnaire consisted of three sections, each serving a specific purpose. The first section provided clear instructions to guide participants in effectively completing the questionnaire. The second section focused on collecting demographic information to gain insights into the characteristics of the sample. The third section included a set of 38 Likert-style items, employing a 5-point scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). These items were designed to gauge the participants' perceptions and attitudes toward the Gamified Learning experience. By employing Likert-style items, the questionnaire enabled a systematic assessment of the participant's level of agreement or disagreement with the statements presented. The questionnaire developed for this study was designed to measure user perception categorized into Gamified Learning, Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, eLearning System Use, and User Satisfaction groups. The Gamified Learning group was assessed using a set of 8 items, while other groups were assessed using a set of five items each, allowing for a comprehensive examination of the participant's perceptions and experiences concerning these groups within the context of the Gamified Learning system.

Instrument Reliability

To evaluate the reliability of the developed instrument for the research study, a pilot study was conducted within the Department of Computer Science at the University of Turbat. The primary aim of this pilot study was to assess the consistency and stability of the measurements obtained from the instrument.

Data Collection

In May 2023, upon completion of the gamified eLearning system implemented during the Spring Semester 2023 at the University of Turbat and an affiliated college, data collection was conducted using the designed questionnaire survey. This survey was administered to the participants, allowing for the collection of relevant data about their experiences in the course.

Analysis

The collected data underwent analysis using Python programming language, and Microsoft Excel 2019. The analysis included reliability testing and descriptive analysis. Reliability testing was conducted to assess the consistency and stability of the data. The descriptive analysis aimed to summarize the key characteristics and patterns observed in the data, providing insights into central tendencies, variations, and distributions.

DATA ANALYSIS & DISCUSSION

Piloting Study Results

To evaluate the reliability of the developed instrument for the research study, a pilot study was conducted within the Department of Computer Science at the University of Turbat. The primary aim of this pilot study was to assess the consistency and stability of the measurements obtained from the instrument. By conducting this preliminary test, any potential issues or areas for improvement could be identified before the main data collection phase.

Demographics of the piloting study participants

Table 1: Gender-wise Distribution of the Piloting Study Participants

Gender	Frequency	Percent
Male	28	56.00
Female	22	44.00
Total	50	100.0

The piloting study included a sample of 50 participants. The gender-wise distribution of the participants revealed that 56% (n = 28) were male, while 44% (n = 22) were female. This indicates a relatively balanced representation of both genders in the study, allowing for a comprehensive analysis of the developed instrument's reliability.

Reliability Statistics

Reliability serves as a crucial indicator that assesses the consistency of scores in a test or scale (Robert F. DeVellis, 2017). To measure the internal consistency of a test or scale, researchers often rely on Cronbach's alpha. Internal consistency refers to the extent to which all the items in a test effectively measure the same concept or construct (Cronbach, 1951). In this study, the questionnaire items were adapted from previous research, ensuring their alignment with the intended measurement (Hair, Anderson, Tatham, & Black, 2019). To ensure the reliability of the instrument's results, Cronbach's alpha test was conducted using the Python programming language. This statistical test generates a numeric value between 0 and 1, with higher values indicating greater internal consistency among the items (George & Mallery, 2019). Typically, a Cronbach's alpha value of 0.7 is considered acceptable, although in certain cases, a value of 0.6 may also be acceptable (Pallant, 2020).

```
import pandas as pd from pingouin import cronbach_alpha
file_path = r'C:\Users\Jamil Murad Baloch\Desktop\Survey.csv'
data = pd.read_csv(file_path)
item_columns = [col for col in data.columns if col.startswith('GL') or
col.startswith('PE') or col.startswith('EE') or col.startswith('SI') or col.startswith('FC')
or col.startswith('ESU') or col.startswith('US')]
```

```
items = data[item_columns]
overall_alpha = cronbach_alpha(items)
print("Overall Cronbach's alpha:", overall_alpha[0])
```

Output

Overall Cronbach's alpha: 0.874

The obtained overall Cronbach's alpha value of 0.874 indicates a favorable level of internal consistency among the items within the instrument. In general, Cronbach's alpha values fall within the range of 0 to 1, with higher values indicating greater internal consistency.

Gamification of the eLearning system

Demographics of Gamification of eLearning Participants

Upon completion of the Gamified Learning courses, the test users were asked to provide their valuable feedback using the developed scale. A total of 192 test users willingly participated in the feedback process. The demographic profile of the participants is presented in the subsequent tables, allowing for a comprehensive examination and analysis of their characteristics.

Table 2: Gender-wise Distribution of the Gamification of eLearning

Gender	Frequency	Percent
Male	108	56.25
Female	84	43.75
Total	192	100.0

The analysis of gender distribution among the study participants, consisting of a total sample of 192 individuals, showed that 56.25% (n = 108) identified as male, while 43.75% (n = 84) identified as female. This notable overrepresentation of males can be attributed to the inclusion of a specific group of students from a boys' college who were enrolled in the intermediate computer science (ICS) class.

Table 3: Age-wise Distribution of the Gamification of eLearning Respondents

Age Level	Frequency	Percent
15-24 Years	192	100.0
25-34 Years	0	0
35 Years and Above	0	0
Total	192	100.0

For this study, three age groups were established, with all participants falling within the age range of 15 to 24 years. This was reflective of the fact that all respondents were either undergraduate students or of a lower academic level.

Table 4: Education Level-wise Distribution of the Gamification of eLearning Respondents

Education Level	Frequency	Percent
HSSC	22	11.46
Under Graduate	170	88.54
Total	192	100.0

Upon analyzing the education levels of the participants, the findings revealed that out of the total sample of 192 individuals, 11.46% (n = 22) were pursuing the Higher Secondary School Certificate (HSSC) degree, while the majority, 88.54% (n = 170), were enrolled as Undergraduates. This distribution can be attributed to the fact that the study focused on individuals primarily with an Undergraduate education, aligning with the targeted population's educational composition.

Table 5: Discipline-wise Distribution of the Gamification of eLearning Respondents

Discipline of Study	Frequency	Percent
ICS	22	11.46
BS in Computer Science	84	43.75
BS in Education	86	44.79
Total	192	100.0

Upon analyzing the participants' discipline of study, it was found that out of the total sample size of 192 individuals, 11.46% (n = 22) belonged to the discipline of Intermediate in Computer Science (ICS), 43.75% (n = 84) were pursuing a Bachelor's degree in Computer Science, and 44.79% (n = 86) were enrolled in a Bachelor's degree program in Education. These results highlight a diverse representation of participants from different academic backgrounds, encompassing both technical and educational disciplines. This diversity in the discipline of study ensures a comprehensive exploration of the impact of gamification in eLearning systems across various educational domains.

Table 6: Experience Groups of Gamification of eLearning Respondents

E-Learning Experience	Frequency	Percent
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Yes	62	32.29
No	130	67.71
Total	192	100.0

Upon examining the participants' prior experience, it was found that among the total sample of 192 individuals, 32.29% (n = 62) reported having prior experience with eLearning systems, while the majority, 67.71% (n = 130), did not possess any prior experience. These findings suggest that a significant proportion of the participants were inexperienced with eLearning systems. This provides an opportunity to explore the effects of introducing gamification in eLearning among individuals with diverse levels of prior experience.

Descriptive Analysis

Descriptive analysis is a vital aspect of research methodology that aims to summarize and present data in a concise and meaningful manner (R. Burke Johnson & Larry Christensen, 2019). Its primary objective is to provide a comprehensive overview of the essential characteristics of a dataset, enabling researchers to explore patterns, trends, and relationships within the data (Alan Bryman & Edward Bell, 2016). It plays a crucial role in the data analysis process by allowing researchers to gain insights into the central tendencies, variability, and distributions of the variables being studied (Field, 2018). By calculating measures such as means, standard deviations, frequencies, and proportions, researchers can quantitatively summarize the key features of the data, providing a solid foundation for further analysis (Barbara G. Tabachnick & Linda S. Fidell, 2021). Furthermore, descriptive analysis plays a crucial role in effectively communicating research findings by presenting data using tables, charts, and graphs derived from descriptive analysis. The collected data were analyzed for descriptive analysis using Python programming language.

```
groups = {'Gamified Learning': data.loc[:, 'GL1':'GL8'],
'Performance Expectancy': data.loc[:, 'PE1':'PE5'],
'Efforts Expectancy': data.loc[:, 'EE1':'EE5'],
'Social Influence': data.loc[:, 'SI1':'SI5'],
'Facilitating Conditions': data.loc[:, 'FC1':'FC5'],
'eLearning System Use': data.loc[:, 'ESU1':'ESU5'],
'Users Satisfaction': data.loc[:, 'US1':'US5'] }
for group, items in groups.items():
group_mean = items.mean(axis=1)
group_sd = items.std(axis=1)
print(f"Group {group}:Mean={group_mean.mean():.2f},
SD = {group_sd.mean():.2f}")
Output
```

Group Gamified Learning: Mean = 4.64, SD = 0.54
Group Performance Expectancy: Mean = 4.11, SD = 0.60
Group Efforts Expectancy: Mean = 3.70, SD = 0.72
Group Social Influence: Mean = 3.65, SD = 0.69
Group Facilitating Conditions: Mean = 3.63, SD = 0.82
Group E-Learning System Use: Mean = 3.53, SD = 0.83
Group Users Satisfaction: Mean = 4.02, SD = 0.59

The analysis of the survey responses reveals the following insights for each group:
Group Gamified Learning: The findings indicate that participants in the Gamified Learning group hold a positive attitude towards the utilization of gamification in educational contexts. The observed mean score of 4.64 suggests a strong belief among participants in the effectiveness of gamified learning as an engaging and impactful approach. This implies that participants perceive gamified learning as a valuable strategy for enhancing the learning experience. Additionally, the low standard deviation of 0.54 indicates a high level of consensus among participants, highlighting a shared viewpoint regarding the benefits and potential outcomes associated with gamified learning.

Group Performance Expectancy: Participants in the Performance Expectancy group have a favorable perception of the technology's impact on their academic performance. The mean score of 4.11 indicates that they believe using technology will help them achieve better grades in their courses. The low Standard Deviation of 0.60 suggests a relatively narrow range of responses within the group, indicating a high level of agreement.

Group Efforts Expectancy: The Efforts Expectancy group perceives that learning and using the technology requires a moderate level of effort. The mean score of 3.70 suggests a moderate agreement with the items related to ease of learning and minimal effort required. The SD of 0.72 indicates some variability in responses, indicating differing perceptions regarding the effort required to use the technology.

Group Social Influence: In the Social Influence group, participants exhibit mixed perceptions of external influence to use the technology. The mean score of 3.65 suggests a moderate level of agreement with items related to peers, teachers, family, and friends' opinions. The SD of 0.69 indicates some variation in responses within the group, indicating diverse perspectives regarding social influence.

Group Facilitating Conditions: Participants in the Facilitating Conditions group perceive moderate facilitating conditions for using the technology. The mean score of 3.63 indicates a moderate level of agreement with items related to 89 technical support,

training, resource availability, and university support. The SD of 0.82 suggests some variability in responses within the group, indicating varying levels of perceived facilitating conditions.

Group E-Learning System Use: The E-Learning System Use group indicates a moderate level of actual usage of the technology. The mean score of 3.53 suggests moderate engagement with the technology. The SD of 0.83 indicates some variability in responses within the group, reflecting diverse patterns of actual usage.

Group Users Satisfaction: Participants in the Users Satisfaction group express a positive level of satisfaction with the technology. The mean score of 4.02 indicates overall satisfaction with the technology's performance. The low SD of 0.59 suggests a relatively narrow range of responses within the group, indicating a high level of agreement.

Within the context of a 5-point Likert scale, commonly employed to gauge respondents' levels of agreement or disagreement with statements, the value of 3 is widely recognized as the midpoint, reflecting a neutral attitude of any explicit positive or negative inclination (Pallant, 2020). Consequently, when assessing the rating assigned to an item on the 5-point scale, scores surpassing the midpoint of 3 are typically regarded as favorable, implying a tendency towards a positive response (Sullivan & Artino, 2013). Overall, the analysis suggests that participants generally hold positive perceptions and experiences with the technology in terms of Gamified Learning, Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, e-Learning System Use, and User Satisfaction.

```
for item in data.columns[0:]:
    item_mean = data[item].mean()
    item_sd = data[item].std()
    print(f"{item}: Mean = {item_mean:.2f}, SD = {item_sd:.2f}") 90
```

Output

GL1. Gamification features in the eLearning system enhance my engagement with the eLearning materials.: Mean = 4.58, SD = 0.57

GL2. Points and grades in the eLearning system motivate my active participation.: Mean = 4.66, SD = 0.60

GL3. Badges and rewards in the eLearning system encourage my involvement.: Mean = 4.60, SD = 0.62

GL4. Leaderboards in the eLearning system stimulate competition and drive performance.: Mean = 4.66, SD = 0.63

GL5. Interactive quizzes and challenges in the eLearning system make learning

enjoyable.: Mean = 4.62, SD = 0.62

GL6. Different levels in the eLearning system provide a sense of achievement and progression.: Mean = 4.68, SD = 0.59

GL7. Immediate feedback provided in the eLearning system helps me understand and improve.: Mean = 4.66, SD = 0.54

GL8. Social interaction features in the eLearning system promote collaboration and knowledge sharing.: Mean = 4.68, SD = 0.55

PE1. Using this technology will help me achieve better grades in my courses.: Mean = 4.26, SD = 0.74

PE2. Using this technology will improve my understanding of course material.: Mean = 4.34, SD = 0.65

PE3. Using this technology will help me prepare for exams more effectively.: Mean = 4.02, SD = 0.82

PE4. Using this technology will make it easier for me to complete assignments.: Mean = 4.02, SD = 0.92

PE5. Using this technology will improve my academic performance.: Mean = 3.89, SD = 0.89
EE1. Learning to use this technology will be easy for me.: Mean = 3.96, SD = 0.85

EE2. Using this technology will require minimal effort.: Mean = 3.55, SD = 0.88

EE3. I will be able to use this technology without difficulty.: Mean = 3.53, SD = 1.04

EE4. I will find it easy to remember how to use this technology.: Mean = 3.84, SD = 0.87
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EE5. I will not have to spend a lot of time learning how to use this technology.: Mean = 3.62, SD = 0.94

SI1. My peers think that I should use this technology.: Mean = 3.58, SD = 0.87

SI2. My teachers think that I should use this technology.: Mean = 4.03, SD = 0.80

SI3. My family thinks that I should use this technology.: Mean = 3.41, SD = 1.01

SI4. My friends think that I should use this technology.: Mean = 3.51, SD = 0.88

SI5. My peers and professors expect me to use this technology.: Mean = 3.72, SD = 0.90

FC1. I have access to technical support if I need help using this technology.: Mean = 3.68, SD = 0.83

FC2. I have received sufficient training to use this technology effectively.: Mean = 3.51, SD = 0.98

FC3. I have access to the necessary resources (e.g., computer, internet) to use this technology.: Mean = 3.88, SD = 0.86

FC4. The university provides support for using this technology.: Mean = 3.38, SD = 0.93

FC5. I have the necessary skills and knowledge to use this technology.: Mean = 3.70, SD = 0.99
ESU1. I have used this technology frequently since adopting it.: Mean = 3.31, SD = 0.97

ESU2. I use this technology regularly in my courses.: Mean = 3.16, SD = 1.01

ESU3. I use this technology consistently.: Mean = 3.44, SD = 0.61

ESU4. I have used this technology more than once.: Mean = 3.61, SD = 1.05

ESU5. I intend to continue using it in the future.: Mean = 4.14, SD = 0.79

US1. Overall, I am satisfied with this technology.: Mean = 3.93, SD = 0.94

US2. I find this technology easy and pleasant to use.: Mean = 3.86, SD = 0.89

US3. This technology meets my academic needs.: Mean = 3.98, SD = 0.73

US4. This technology is useful to me.: Mean = 4.22, SD = 0.84

US5. I am happy with the performance of this technology.: Mean = 4.10, SD = 0.86

Group Gamified Learning: Participants in the Gamified Learning group demonstrate a highly positive perception of gamification features within the eLearning system. The mean scores range from 4.58 to 4.68, indicating their belief that gamified elements enhance engagement, motivation, involvement, competition, enjoyment, achievement, and social interaction. The standard deviations range from 0.54 to 0.63, suggesting a moderate level of variation in responses within the group.

Group Performance Expectancy: The participants' responses in the Performance Expectancy group indicate a generally positive perception. The mean scores range from 3.89 to 4.34, suggesting that using the technology is perceived to improve academic performance, understanding of course material, and effectiveness in exam preparation. The standard deviations range from 0.65 to 0.92, indicating some variation in responses within the group.

Group Efforts Expectancy:

Group Efforts Expectancy: participants generally perceive learning and using the technology to be manageable. The mean scores range from 3.53 to 3.96, indicating a moderate level of agreement with the items. The standard deviations range from 0.85 to 1.04, suggesting some variability in responses regarding the ease and effort required to learn and use the technology.

Group Social Influence: The Social Influence group reveals mixed perceptions of external influence to use the technology. The mean scores range from 3.41 to 4.03, suggesting varying levels of agreement with the items related to the influence of peers, teachers, family, and friends. The standard deviations range from 0.80 to 1.01, indicating some variability in responses within the group.

Group Facilitating Conditions: Participants generally perceive favorable facilitating conditions for using the technology. The mean scores range from 3.38 to 3.88, indicating a moderate level of agreement with the items related to technical support, training, resource availability, and university support. The standard deviations range from 0.83 to 0.99, suggesting some variability in responses within the group.

E-Learning System Use:

The E-Learning System Use group reflects varying levels of actual usage patterns among the participants. The mean scores range from 3.16 to 4.14, indicating different degrees of engagement with the technology. The standard deviations range from 0.61 to 1.05, suggesting some variability in responses within the group. Group Users Satisfaction: Participants generally express a positive level of satisfaction with the technology. The mean scores range from 3.86 to 4.22, indicating overall satisfaction with the technology's performance, usefulness, and meeting academic needs. The standard deviations range from 0.73 to 0.94, suggesting a little variability in responses within the group.

Overall, the analysis reveals that participants hold positive perceptions and experiences with technology. However, there is some variability in responses within each group, indicating diverse perspectives and experiences among the participants

The primary objective of this study was to collect users' perceptions concerning the gamification of an eLearning system. Employing a quantitative-based cross-sectional design, a structured questionnaire was utilized to gather responses from the participants. Through this approach, the study aimed to ascertain the impact of gamification on the overall eLearning experience as perceived by the users.

Based on the collected data, participants' perceptions of the technology were examined across various aspects. The results revealed that participants held high expectations for the technology's positive impact on academic performance, particularly evident in the Group Gamified Learning (mean score: 4.64, standard deviation: 0.54) and the group Performance Expectancy (mean score: 4.11, standard deviation: 0.60). However, opinions were more diverse regarding Group Efforts Expectancy, with a mean score of 3.70 and a standard deviation of 0.72, indicating varying views on the effort required for effective technology use. Regarding Group Social Influence, participants perceived a moderate level of external influence (mean score: 3.65, standard deviation: 0.69) with stronger support from teachers compared to opinions from peers, and family. Group Facilitating Conditions analysis suggested a moderately favorable environment for technology usage (mean score: 3.63, standard deviation: 0.82), though the support provided by the university was perceived as relatively lower. Participants reported a moderate level of actual technology usage, demonstrated by the Group E-Learning System Use (mean score: 3.53, standard deviation: 0.83), showing varying adoption rates among participants. Lastly, participants expressed high satisfaction with the technology (mean score: 4.02, standard deviation: 0.59), stating its usefulness for their academic needs and overall contentment with its performance.

These results suggest that the incorporation of gamification elements in eLearning systems can be an effective strategy to enhance user engagement and satisfaction, contributing to a more enjoyable and productive learning experience for users.

RECOMMENDATIONS

Based on the study's findings, the following recommendations are proposed for educators, instructional designers, and administrators in eLearning environments:

Integrate Gamification Elements: Educators and instructional designers should actively incorporate gamification elements into their courses to enhance user engagement, motivation, and satisfaction. By leveraging gamified features effectively, learners are more likely to have a positive and enjoyable learning experience.

Foster Instructor Support and Social Influence: Recognize the influential role of instructors in shaping user perceptions. Educators should actively encourage learners to adopt technology. Additionally, acknowledging the impact of peer and family support can strengthen learners' acceptance of gamified eLearning systems.

Address Effort Expectancy Perceptions: To enhance user experiences and minimize adoption barriers, educators should focus on improving user interface design and system accessibility, making the technology user-friendly and accessible for all learners.

Optimize Facilitating Conditions for Technology Usage: Identify specific areas for improvement in facilitating conditions for technology usage. Enhancing institutional support and technical resources can create a conducive environment, promoting seamless integration of gamification in eLearning systems.

By implementing these recommendations, educational institutions and professionals can harness the potential of gamification to create more effective, engaging, and successful eLearning environments, ultimately benefiting learners' academic experiences and achievements.

Future research in the area of gamification in eLearning can further expand our understanding and implementation of this innovative approach. Some potential avenues for future research include:

Longitudinal Studies: Conducting longitudinal studies to examine the long-term effects of gamification on learning outcomes and user engagement would provide valuable insights. Understanding how gamification impacts knowledge retention and academic performance over extended periods can help establish its sustained effectiveness.

Personalization of Gamification: Investigating the role of personalized gamification experiences in eLearning could lead to more tailored and adaptive learning environments. Understanding how individual preferences and learning styles influence the effectiveness of gamification can enhance its implementation.

Gamification in Different Educational Levels: Exploring the impact of gamification across various educational levels, from primary education to higher education, can

provide insights into its suitability and effectiveness for learners at different stages of development.

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