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A Potent View on the Effects of E-Learning

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ABSTRACT

Due to the pandemic, there has been a drastic change in the advancement of online learning platforms. This article will help us understand the reasons for the increase and decrease of using online learning platforms. Based on the research conducted, it was observed that almost the majority of the students (48.4%) have not completed the enrolled course. Few of the students have come at least halfway (14.5%) to the completion of the course. And the rest of the students (37.1%) responsibly completed the enrolled course; almost half the students who haven't completed the course indicated that the main barrier faced among the students is the lack of interaction (36.7%).

KEYWORDS

collaborative Learning, Data Visualization, E-Learning, Great Learning, OECD, online education, Online Learning, Online Learning Platform

1. INTRODUCTION

The development of information technology in the twenty-first century has had a profound effect on the economic, social, and educational aspects of society. One prominent change in the education sector is the integration of computers and information and communication technology (ICT) into teaching and learning methods to facilitate dynamic education and the attainment of objectives.

Gamification is an emerging and disruptive field in the realm of eLearning. There has been a surge in the utilization of online learning systems. Online learning is an educational approach that utilizes the internet for self-education. Various educational sites, such as Coursera, Udemy, Great Learning, and others, exist. Institutions sought a method to provide education to students within the confines of their own residences. The transition to virtual learning has brought about significant changes. It has compelled students to utilize technology to enhance their talents and other facets of knowledge, while also proving to be highly time-consuming. Despite the assistance provided by online learning systems, individuals have required support in adapting to this lifestyle. The pupils and instructors encountered numerous difficulties in adapting to the digital instruction. Based on the findings, over 1.2 million university college students fail to complete their studies and leave every year due to a lack of desire. Additionally, only about 56% of university college students manage to finish their four-year degrees within a six-year timeframe. It is contended that this is a result of inherent deficiencies

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in the way we educate, using the most advanced methods available. Observe a solitary presentation on trends in educational innovation, and the instructor is likely to highlight the striking similarities between a contemporary study environment and one from centuries ago. Research has confirmed that implementing gamification in various decision-making processes has led to increased engagement and motivation. There are multiple approaches to incorporating gamification into your college classroom.

The study was focused on the students of the final-year Bachelor of Computer Applications program of the Hindustan Institute of Technology and Science in Padur, Chennai, India, during the 2019–2022 academic year. This poll was conducted among BCA students in their final year. Created a gamified e-learning website, and they will study both online (using the gamified website) and offline mode. i.e., they will study the same fifth and sixth-semester courses in parallel. They finally discovered a significant gap between gamified e-learning and our classroom instruction based on internal assessments (internal 1 and 2). Students obtained good grades in online Learning compared to our classroom teaching last year.

2. LITERATURE SURVEY

An evaluation of literature associated with instructing with online guides in facts technological know-how (e.g., programming, software program engineering) indicates that the gamification theme needs to be more adequately explored, with the lack of theoretical and empirical lookup that would involve gamification methodology. (Zualkernan, I, 2019) From a specific angle, a learn about by way of (Hu et al., 2016) outline it as engagement that takes place when college students use an online mastering platform in their getting to know this environment; the college students themselves can solely get the right of entry to the studying materials. (Ali, L, et al, 2020) Research, a find out about through (A BERNIK) on academic e-courses that include solely a sequence of motivating factors of laptop video games however do now not consist of taking part in PC video games has intensified considering that 2010. This discipline of lookup is called gamification and represents the use of sports factors (mechanics, dynamics, and aesthetics) in a discipline (education, advertising marketing, etc.) that is now not a PC game. An overview of literature associated with educating online guides in facts and technological know-how (e.g., programming, software program engineering) indicates that gamification needs to be more adequately explored, with the lack of theoretical and empirical lookup that would contain gamification methodology. (Auvinen, T, et al, 2019) The use of gamification learned about through (Samuel Kamunya) in schooling, has been considered a modern method to introduce the advantages of video games in a nongaming context. For a profitable gamification method in Learning, motivational theories and behavioral results for the learner have to be included in the sketch framework. Given this, the learn about proposes a framework for figuring out video game factors as motivational affordances that impact the learner's behavioral effect. (Bodily, R, et al, 2018) This article gives an idea for a gamification framework for online distance publications to analyze how to program. This framework a find out about using (Martinha Piteira) is composed of the following dimensions: goal audience regularly occurring goals. (Arnold, K. E, et al, 2020) The outcomes are about using (Andrija Bernik) of alearn, which was once carried out in two stages. The first phase of the paper includes literature search findings. It analyzes the present self-assessment scales for measuring the motivation and delight of college students developed through different authors. In the 2nd section of our find-out, we created a battery of self-assessment measures for gathering statistics for an overarching set of gamification-related constructs/variables chosen according to those pronounced in the literature). (Dascalu, M.-I, et al, 2020) Gamification is a find by way of (Erica et al.) and has been extensively employed in academic contexts to enhance students' engagement and beautify the getting-to-know process. In this sense, the existing work investigates the effect of gamification on students' conduct and overall performance via getting-to-know paths, i.e., sequences of getting-to-know objects observed by using college students while interacting with a digital getting-to-know environment (Errol et al. et al., 2021).

Table 1. Findings of gamification elements over e-learning

Author, year, journal (book, conference proceeding title)	Research Strategy	Theme	Key findings	Gaps
Utomo, Andika, et al. "Gamified E-learning model based on a community of inquiry." In 2014 International Conference on Advanced Computer Science and Information System, pp. 474–480. IEEE, 2014.	Case study (observation)	By observing students, we are able to determine the impact of the gamification environment on the e-learning system.	While the introduction of gamification had no appreciable impact on participation levels, its removal led to a significant decrease in student participation.	Technical concerns and environmental impact could affect the outcome. First- and second-week instructional material adjustments may impact student engagement. Participant opinion is last. Different participant personalities alter discourse and communication, which may affect the outcome.
Bernik, Andrija, et al. "Measurement of the effects of e-learning courses gamification on motivation and satisfaction of students." In 2018, the 41st International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), pp. 0806–0811. IEEE, 2018.	Grounded Theory, Experiment (201 students)	This study examines student motivation and satisfaction self-assessment techniques. Develop self-assessment tools for gamification constructs and variables.	Learning efficacy, motivation, and online course satisfaction should quantify gamification's impact. Gamifying e-learning courses can create a more attractive, motivating, engaging, enjoyable, and collaborative virtual environment, which may compensate for when instructors' time, effort, and technological innovation exceed learning effectiveness.	Gamification had little impact on learning achievement compared to the time and effort needed to create and run this online course. The authors noted that teachers may struggle with gamification and technology. Organisational inertia may impede school gamification support. Teachers may be sceptical of gamified learning for numerous reasons.
Bernik et al. "Introducing gamification into e-learning university courses." In *2017, the 40th* International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), pp. 711–716. IEEE, 2017.	Case study and survey	The integration of gaming principles from video games into online learning environments may have an impact on student outcomes.	Implementing gamification in online courses can enhance student motivation and optimise the efficiency of the course. The study's authors contend that gamification prioritises student motivation during the learning process, enhances the entertainment value of an online course, and amplifies students' want to learn and interaction with course materials.	The study was carried out in higher-level classrooms. Although students make use of the test E-learning system, they still have responsibilities for their courses. The research experiment for each course was strategically coordinated with other assignments and the academic calendar.
Bouchrika et al. "Exploring the impact of gamification on student engagement and involvement with e-learning systems." Interactive Learning Environments 29, no. 8 (2021): 1244–1257.	Case study (899 participants), descriptive statistics	Gamification's effects on student learning engagement, e-learning interaction, and persistence	Empirical evidence indicates that gamification positively impacts the level of engagement, motivation, and adoption of e-learning tools among students who have actively contributed to the platform by publishing content and earning scores.	The investigation was conducted on a sample of participants, predominantly aged 18 to 26, who possessed a basic comprehension of the underlying technologies. Additionally, proficiency in Arabic and French is required, which may provide a challenge for the candidate in gaining admission to an international educational institution.

continued on following page

Table 1. Continued

Author, year, journal (book, conference proceeding title)	Research Strategy	Theme	Key findings	Gaps
Hassan et al. "Adaptive gamification in e-learning based on students' learning styles." Interactive Learning Environments 29, no. 4 (2021): 545–565.	Experiment (200 students)	This study presents a framework that utilises students' interactions with the system to identify their individualised learning preferences and provide them with a tailored gamified experience.	The experiments demonstrated a decrease of 26% in the dropout rate among students, accompanied by a corresponding increase of 25% in their motivation levels.	The framework does not provide students with feedback on the accuracy or errors in their thoughts. Additionally, the framework does not necessitate the promotion of students to rectify any knowledge gaps prior to entering the system.
Lenz et al. "Field Guide to Gamification: Game Components and Motivation in Higher Education." In International Conference on e-Learning, pp. 505-XIV. Academic Conferences International Limited, 2018.	Grounded theory	The MDA (Mechanics-Dynamics-Aesthetics) framework on game creation and student-centric gamification designs in higher education helps to bridge the gap between motivational categories and goals.	To recap, the complexity of gamification is largely underestimated, therefore much in-depth research on which solutions would work best for various groups has yet to be conducted. This is a gamification method that some people will like.	The broad breadth of the directions needs to be narrowed down.

2.1 Empirical Evaluation of Gamification Elements in E-Learning

Developed a website including gamified e-learning specifically tailored for third-year students enrolled in the BCA programme. During both the fifth and sixth semesters of their academic careers, students have the opportunity to pursue courses in computer graphics, data warehousing, data mining, as well as Introduction to Java Programming and Introduction to Python Programming. Furthermore, a number of classes that are pertinent to particular occupations have been incorporated. This course covers the following topics: Software Testing, Full Stack Development, Advanced Python Programming, and an Introduction to AI and ML. Within the portal, there is a designated tab for enrolling in E-Learning courses. Upon successful creation of login, a One-Time Password (OTP) will be dispatched to the email address you have supplied. Once you have provided the necessary information, you may proceed to log in by generating a sign-in using the credentials you have recently created. Prior to enhancing the application's defences, it is critical to execute this method.

To access the courses, students must sign in and provide your credentials on the sign-in page. Development is only possible from the foundational principles to the more intricate stages. To access

the advanced classes in the programme, it is necessary to complete both the fifth and sixth semesters. All courses, together with their corresponding PDF notes and video format, are uploaded. If the candidate is currently registered in the fifth semester of Python Programming, they will be required to take a quiz at the end of each quarter of the course, which accounts for 25 percent of the overall grade. Upon achieving a sufficiently high score, the user will be awarded points that will be calculated and shown on a scoreboard located within the dashboard. Upon completion of 50% of the course, an email will be sent to the user's specified signup email ID, serving as a reminder of the outstanding coursework accessible through the finished courses' dashboard. The grading criteria are determined by the courses, and the nature of the assignment may vary between different courses, depending on the programming or scripting involved. The motion pictures are uploaded in their entirety as full course videos to provide users with an additional means of comprehending the subject, since they can more readily grasp the content by visually engaging with the videos while reading the text. An important feature is the ability to access the video offline by downloading it and viewing it at your convenience, regardless of your internet connection status. The quiz feature will be accessible to students upon completion of 25 percent of the course, and you will be presented with a quiz after finishing each consecutive quarter of the course. Upon successful completion of each course, the user is granted a reward point and an electronic certificate of completion.

- Points
- Rewards
- Achievement
- Progress Bar
- Leader boards
- Trophies & Badges

2.1.1 Points

Points are the most general reward, representing progress or currency. Points, like levels, show a user's reputation based on their actions. They can be granted for numerous acts and allow simple balance of related accomplishments. Numerous points can be spent or not. Apart from badges, users can get points. Points can be exchanged, unlike badges. Participants can gain points for finishing the quiz faster or asking more questions and use them for course discounts or class suggestions.

2.1.2 Rewards

Rewards are crucial game design components in gamification that motivate users to continue engaging in the gamified environment. Reward systems in gamification enhance the connections between users and the gamification system.

2.1.3 Achievement Badges

Individuals have a preference for incentives. Even if the incentive is merely a visually appealing image seen online. Achievements serve as a means of rewarding users for notable accomplishments, such as consistently studying for 10 consecutive days or successfully completing 15 tasks without any mistakes. This is both gratifying (similar to receiving a gold star in primary school) and valuable, as it motivates users to engage in advantageous activities for their learning. The accomplishments must be meticulously crafted. Alternatively, they could potentially encourage users to engage in activities that enhance the enjoyment of learning but diminish its effectiveness.

2.1.4 Progress Bar

It provides an excellent method to demonstrate the user's level of achievement. Completing the task provides a gratifying sensation and stimulates the learner. Progress bars visually represent the

advancement of a particular assignment and the overall programme. Although the implementation is quite straightforward, it nonetheless provides significant benefits. A progress bar is superior to a basic indicator ("50% of the course complete") due to its visual nature. The consumer can easily comprehend the extent of their progress without any further consideration.

2.1.5 Leader Boards

Incorporating a competitive element into an application will incentivize users to exert significant effort in order to surpass their peers. Undoubtedly, this is a crucial element in optimising learning effectiveness. It is possible to have distinct leader boards based on the number of courses, nations, or departments that you want to involve. It is imperative that the leader board displays individuals' achievements without subjecting them to humiliation for their shortcomings. Alternatively, it may yield a contrary outcome and repel individuals from your product.

2.1.6 Trophies and Badges

Badges provide learners with the chance to acquire incentives. This fosters motivation to persist in acquiring knowledge, accumulate additional badges, and assess one's own performance in relation to other participants. Badges enhance learners' motivation.

3. EVALUATION PROCESS

The last batch of BCA students was chosen for this survey, and 110 students participated. Instructors gave fifth and sixth-semester students access to a gamified website for learning throughout that period. Found that there was a significant difference between gamified online Learning and conventional classroom lectures after a full year of observation.

Students have participated in gamified websites in addition to traditional classes for the evaluation process. Students have had two internals per semester for physical education, including an assignment and a surprise test. Participants have used gamification strategies for e-learning courses, such as points, rewards, and achievement badges. Students will receive points if they complete a specific course in the first level. The student will then advance to the following level and receive second-level rewards. Achievement badges are the name given to the final level. He or she earned the achievement badge, demonstrating they successfully passed the first internal. The physical class test is equivalent to that test. We have assigned a particular mark to each gamification level. According to the time it takes to finish the test or assignment, the person receives marks, for instance, if they complete the first level (points).

Each group of students has been separated into two batches. A section of the class will receive the usual lectures and exams, while the second batch of students will participate in the online version of the gamified procedure. For both batches, there will be a total of 100 points available for evaluation. Physical exams such as internal, surprise, and final exams will be given to students in physical education classes. After the course, these will add up to 100 points. In order to advance to the next phase of the online gamified process, students must acquire a minimum of forty points. There are a variety of stages in each level. Every time a level is completed, the students will receive a badge. According to the data that badges give, the earned badges will be considered in a scoring system.

3.1 Evaluating Academic Performance

After one year of testing, it was discovered that traditional classroom instruction differs from online instruction on gamified websites. The students log more hours each week on the online learning platform despite having a lower overall attendance percentage than when they attended traditional, in-person classes. The results of the three quizzes I gave to the students in a traditional classroom setting and on e-learning sites were different. The online learning quiz that the students were assigned

has been finished. The pupils have finished their assignments online and have done so up to this point. Participants have completed both the first and second of our internal tests. Instructors have prepared various questions for the students to answer (depending on the course material), and they can access them online and offline. The online mode of the test was successful for the students.

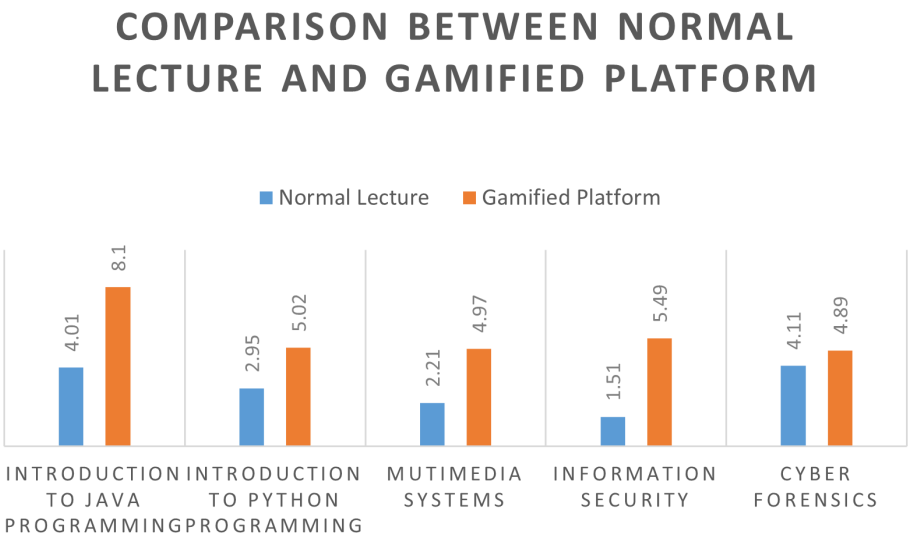
4. LEARNING PATH RECOMMENDATION USING COLLABORATIVE FILTERING TECHNIQUE

Collaborative filtering is a recommendation technique that automatically predicts a user's preferences by collecting preferences from many users. In the context of job recommendations for candidates based on the dataset you provided, collaborative filtering can be applied to find similarities between students and recommend jobs based on the preferences and performance of similar students.

Table 2. Comparison between students received marks in normal lecture class and through gamified e-learning website

No of Students	SUBJECTS	NORMAL LECTURE CLASS			GAMIFIED WEBSITE			Difference B/w CIA-1 & CIA-2	
Fifth sem students	Semester-5	CIA-1 Average Mark	CIA-2 Average Mark	Difference	CIA-1 Average Mark	CIA-2 Average Mark	Difference	Normal Lecture	Gamified Platform
65	*Introduction to Java Programming*	**59.13**	**55.12**	**4.01**	**73.33**	**65.23**	**8.1**	**4.01**	**8.1**
65	*Introduction to Python Programming*	**61.23**	**58.28**	**2.95**	**70.12**	**75.14**	**5.02**	**2.95**	**5.02**
65	*Multimedia Systems*	**69.56**	**67.35**	**2.21**	**76.43**	**71.46**	**4.97**	**2.21**	**4.97**
65	*Information Security*	**65.25**	**66.76**	**1.51**	**77.27**	**71.78**	**5.49**	**1.51**	**5.49**
65	*Cyber forensics*	**67.58**	**63.47**	**4.11**	**78.38**	**73.29**	**4.89**	**4.11**	**4.89**

Figure1. The average scores between the regular class and gamified platform after the first test and the second test



Steps

1. User-Item Matrix
   Treat each student as a user
   Treat Subjects as items
   Populate the matrix with the marks of students in each subject
2. Similarity Calculation
   Use similarity metric to calculate the similarity between users (students)
   This will help identify students with similar academic performance.
3. Neighborhood Selection
   Identify a set of similar students (neighborhood) for each student. This set will be used to make job recommendations.
4. Weighted Average
   Calculate a weighted average of the student's marks in the neighborhood for each subject. Use the weights as similarity scores.
5. Learning Path Recommendation
   Recommend jobs to each student based on the predicted marks for each subject. Higher predicted marks indicate a better fit for a job in that domain.

4.2 Pseudocode for Learning Path Recommendation

```
# Step 1: Initialize user-item matrix
Initialize an empty user-item matrix where rows represent users
and columns represent learning paths.
Fill the matrix with ratings or binary values indicating user
interactions with learning paths.
# Step 2: Calculate the similarity between users
For each pair of users (u1, u2):
    Calculate the similarity score using a metric like cosine
similarity or Pearson correlation coefficient.
    Store similarity scores in a user-user similarity matrix.
# Step 3: Predict user preferences
For each user (u):
    For each learning path (p) not interacted by the user:
        Find similar users who have interacted with the learning
path (p).
        Calculate a predicted rating for the user (u) on learning
path (p) using the ratings of similar users and their similarity
scores.
# Step 4: Generate recommended learning paths
Sort predicted ratings for each user and recommended the top N
learning paths with the highest predicted ratings.
# Step 5: Generate recommendations for a specific user
user = selected_user
recommended_paths = generate_recommendations(user, user_item_
matrix, similarity_matrix, N)
function calculate_similarity(user1, user2):
    # Calculate the similarity between two users
    # Implement a similarity metric like cosine similarity or
Pearson correlation coefficient
```

```
    similarity = ...
    return similarity
function predict_rating(user, learning_path, user_item_matrix,
similarity_matrix):
    # Predict rating for a user on a learning path
    similar_users = find_similar_users(user, learning_path, user_
item_matrix, similarity_matrix)
    total_similarity = 0
    weighted_sum = 0
    for each similar_user in similar_users:
        similarity = similarity_matrix[user][similar_user]
        rating = user_item_matrix[similar_user][learning_path]
        weighted_sum += similarity * rating
        total_similarity += similarity
    if total_similarity != 0:
        predicted_rating = weighted_sum / total_similarity
    Else:
        predicted_rating = 0  # Default value if no similar users
    return predicted_rating
function find_similar_users(user, learning_path, user_item_matrix,
similarity_matrix):
    # Find users similar to the given user who has interacted with
the learning path
    similar_users = []
    for each other_user in user_item_matrix:
        if user_item_matrix[other_user][learning_path] != 0 and
user != other_user:
            similar_users.append(other_user)
    return similar_users
```

5. CONCLUSION

The need of student involvement and motivation has been important in transitioning from traditional classroom pedagogy to the current online education paradigm. Additional and more important lessons have been transitioned to an online format, resulting in a more complex learning environment. Instructors now have the opportunity to engage in direct face-to-face communication with all students in the class, which is a feature lacking in modern online teaching methods. Therefore, it is essential to effectively handle student involvement in virtual classrooms. This research utilized an extensive array of innovative and stimulating online teaching tools to ensure that students remain interested and motivated throughout all lectures, whether they are delivered live or recorded. The next research for this study aims to employ more sophisticated approaches for Learning, such as Virtual Reality (VR) and Augmented Reality (AR) technologies, in order to enhance user retention.

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