

# Instructional Design Strategies for Using Gamification in E- Learning: A Case Study

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## **Abstract:**

“Gamification” is the art of deriving all the fun and engaging elements found in games environment and applying them to real-world or productive activities. This process called “Human-Focused Design,” It’s a design process that optimizes for human motivation in a system; it is usually understood as a pedagogical strategy that favors student engagement and motivation. Gamification “prepares learners to be active and take responsibility upon their own learning process”. Lectures with fun games are introduced to be more effective in showing a positive outcome, as learners are motivated to play more instead of getting the information through traditional ways. This study aimed to explore and to design a framework for Gamification used in e- learning course for undergraduate students. This study also aims to suggest the use of game play in the concept of game-based learning in E-learning courses. In This research we will examine the role of Gamification in designing E-learning course. Furthermore, this playfulness is expected to reduce the stress experienced by users. The research was conducted using a practical method by giving undergraduate student assignment of designing E-learning games and framework then this will be evaluated with peer evaluation process by using rubric. The results showed that integrating Gamification into E-learning improved learners’ creative, critical and problem-solving skills. Thus, Gamification framework is able to provide pleasure and better understanding, which in turn will reduce the user's stress level and will reduce user resistance and increase the effectiveness of technology implementation.

## **Keyword:**

Gamification  
E-learning  
Game-based learning  
Motivation

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## **1. Introduction:**

Currently, the urgent need to work online and collaborate using a platform requires users to adapt to new online media in a short time. The current generation is digital addicted, so if we use traditional E- learning tools, it won’t be motivated for the learners. “Gamification” has been developed in different systems, like learning systems. Also it

promotes intrinsic and extrinsic motivation [1]. “Gamification” also offers an experience with rules, emotions, and social roles, which lead to converge in the learning process [2].

Gamification has proven to be a useful teaching tool to engage students that based on the mechanic of rewards, especially in online environments.

*Table 1. Gamification aspects in e- learning [3]*

The experience aspect	When the student receives immediate feedback in several attempts in process or confronts them with a challenge
The emotional aspect	When the student gets recognition for their achievement
The social aspect	When the achievements are socialized through a board of leadership or when the students collaborate to complete a challenge or mission

The main concept of Gamification has been used to motivate workers and customers in order to perform certain actions. From an “educational point of view”, as game concepts have been used to motivate, stimulate, and impart content so Gamification is not a new strategy

The use of these game elements in education will not only be performed during the early childhood educational stages, playing experiences can be enjoyed regardless of age and education level or environment. [4]. When introducing different

methodological strategies in E-learning, it is important to evaluate them in different ways. It means we should also evaluate each step of the process.

## **2. Literature Review:**

According to the study of Giang, “Games are where players being thrown into an environment in which they are to solve problems to move forward without knowing the outcomes of their decision”, it have no other purpose than to please the individual who playing them [5]. Through games environment,

learners are able to learn in an exciting and entertaining way besides increasing their knowledge and understanding of the subject matter [6]. This behavior allows them to compete in a friendly manner and to be active to answer questions in order to obtain points to “win” the game. Since games have spent decades depending on how the user qualify, learning how to master motivation and engagement, we are now learning from games, and that is why we call it Gamification.

On other hand Gamification can provide a higher learning context to help learners construct knowledge through mysterious and challenging a multiple opportunities [7]. In the research of Zimmerman & Cunningham they defined Gamification as “the process of game-thinking and game mechanics to engage users and solve problems”[8]. Therefore we can define Gamification as “The process of adding game elements or mechanics to an experience to increase engagement or enjoyment”. The end result in Gamification “the points, rewards, being first place, completing as much as possible, not being last place” can easily become the focus, rather than the learning. That is why Gamification can affect the learners to rely on extrinsic motivation. This is the mental condition that drives a person to behave a certain way or engage in an activity to win a reward or avoid a punishment [9].

Gamification can be used in higher education in order to increase learners’ “motivation and engagement” in a learning task [10]. Teachers should understand that that game design elements are more difficult to define, it will need multiple theoretical frameworks each with special classification systems and levels of abstract ideas [11]. According to the latest studies they show beneficial and positive responses towards the use of Gamification in E- learning. Gamification based on rewards has proven to be a useful teaching tool to engage students, particularly in online environments [12].

According to Calli, W.; Game-based Learning is “a type of active learning experience within a game framework, which has specific learning objectives and measurable outcomes” [13]. In Game-based Learning Teachers play an important role to build fun learning environment for learners to transfer theoretically only account for 20% learning, it’s the 20% that can make or break a learning experience.

#### **Gamification design framework:**

In this paper we will create a framework for Gamification to help our students in creating their game application that will apply in E-learning course. The framework consists of three main phases; (1) Discovery, (2) Design, and (3) Action /

knowledge and to prepare learners for their future. Also, game-based learning can help weaker learners to catch up with lessons easily with the integration of materials as a form of learning aid. [14].

To show the difference between game based learning and Gamification: (1) in game-based learning, the game is the learning experience, while in Gamification; the game components are added to the traditional educational instruction. (2) In Gamification, the end result can easily become the focus, rather than the learning. And Games-based learning takes the content of your learning material and makes it fun. (3) Gamification is an application of game done to promote a specific desired behavior to drive those learning outcomes. And we can use games-based learning in a corporate setting where students’ are learning new skills.

According to Clark& Mayer; E learning is “any instruction that is delivered on a computer”, which has the following characteristics: (1) Includes content relevant to the learning feature. (2) Uses instructional methods such as examples or practice exercises to help learning. (3) Uses a variety of media elements to deliver the content and methods. (4) Builds new knowledge and skills, which are linked to improve organizational. (5) Performance [15].

Depending on the teaching style of the faculty and the course content, instruction can take place synchronously (all participants in the course log in at the same time) or asynchronously (participants log in and participate as their schedule permits), or some combination of the above.

According to the 70/20/10 model [16] of learning and development; only 10% of learning happens in a formal classroom environment. The remaining 20% and 70% comes from developmental relationships (i.e. interaction with peers) and challenging assignments, respectively.

Examining blended learning methodology, the participants to a lot of different stimuli and encourages them to apply the things they’ve learned into their work on a daily basis. That’s where 70% of long-term professional development happens. Combined with peer-to-peer collaboration and discussions on a digital facilitation platform, blended learning truly sets the participants up for success.

And while these developmental relationships May Feedback Loops. Each phase contains interactive steps to consider as they build their final solution.

1- Discovery: The discovery phase is all about identifying the real problem that needs solving and understanding the target audience with also designing the user experience. It consists of three main steps: (a) Define the Problem (what the e learning course outcome). (b)

- Define the Users (understand the people who are going to be involved and using the system), also target audience research is a very important part of solution design at times. (c) Define the user interface (the game environment, how the winning will look alike)
- 2- Design the User Journey: (understand and start to build the concept of the experiences for each of the phases of the User Journey). Next, the next step is to design and build the user experience. In the user experience-designing step we can call it the behavior (What the users will do? What are the current behaviors and what do they need to be?) Motivation is a part of the designing step (what is the reward?). In Emotions (What the players will feel when they engage with the Gamification system?) Mechanics is about (that will drive the system and engage your users). Define the program or the application and the delivery mood.
  - 3- Action / Feedback Loops: This consists of a
    - (a) Call to action, or the instruction or prompt given to the player to do something.
    - (b) User Action.
    - (c) Feedback (information about how far they have succeeded).
    - (d) Refine (is to iterate and refine the final design).

In Gamification design we can work also by using mail four categories: (1) game elements. (2) User types. (3) Motivations. (4) Rewards.

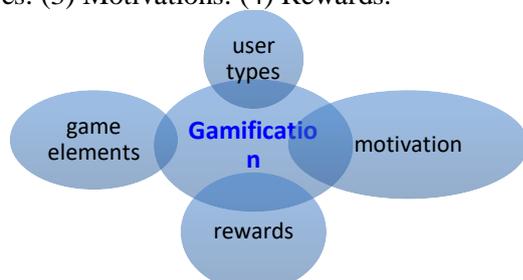


Figure 1. Gamification framework

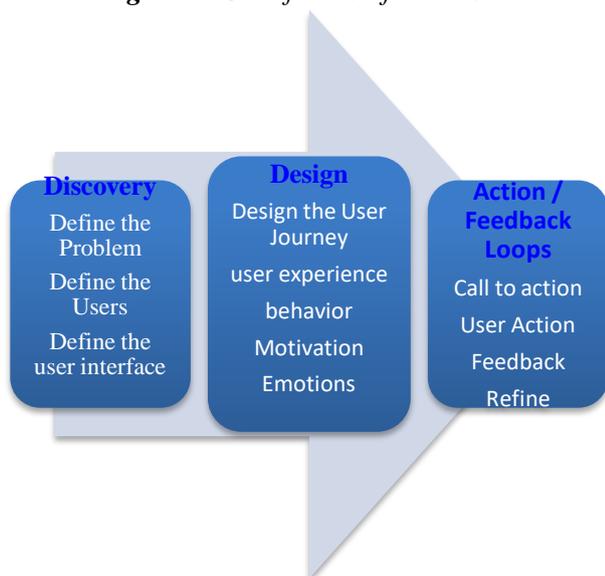


Figure 2. Full Gamification design framework

### 3. Methodology:

The study was conducted on 20 students divided into 4 groups, studying at the new media department in modern university for technology & information, in Egypt. The participants were in their fourth semester of the four years programme.

In this study the students was asked to design interactive game for e- learning course, the Gamification environment consist of (1) a system of rewards are based on the superpowers narrative, (2) badges, (3) and avatars, with the purpose of promoting motivation, attention, and engage. The main aims are to design a framework for Gamification and apply this framework in e- learning course. Rubric was designed to evaluate each project with a total degree of 100 points. The results were analyzed and discussed using Peer assessment evaluation.

#### Case study:

##### First game:

Idea of game; Game is about Anatomy specially quests in Anatomy, it have many levels all of them taking about level in material students learned it in college like Anatomy one, Anatomy two, etc.

It have a very easy questions in game and when you win in the level you going to the next level that more hardly before level one and so on.

Questions are more specific and clear to be easily for students to know answer.

In the answer you have choices to choose from them like MCQ questions, when you chose the answer appear the true one, then you know if the answer is true or not.

#### Target audience:

From 17 to 25 years old (Students in medical college, Physical therapy and human medicine).

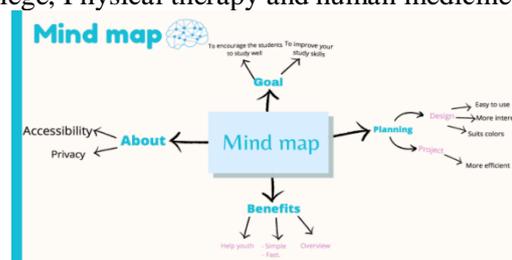


Figure 3. Mind map design

#### Colors shades:

The blue symbolizes the head, confidence, sincerity, wisdom, confidence, trust, faith and piety, and the blue color has an effect on the mind and body.

The White is the color usually associated with peace, goodness, honesty, purity, beginning, renewal, neutrality, perfection and perfection.

Gray is one of the neutral colors in colors, just like brown and wheat, and black and white, which by combining it with bright colors results in attractive and distinctive designs.

Game divided into



Figure 4. Game levels



Figure 5. First avatar



Figure 6. Second avatar

Level 1 ( First aid game )



Figure 7. First aid game

Level 1 ( Anatomy game )

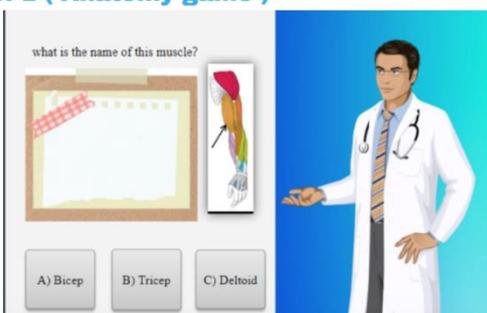


Figure 8. Anatomy section of the game

Second game:

**Game idea:** this game is a virtual reality game using in e learning course to educate the students about Covid -19

**Goals:** to have fun, Awareness message about coronavirus, and to take the necessary precautions.

**Target audience:** Mainly gamers between the ages of 12-17 years old and above, as this game is suitable for all ages.

**User experience goal**

**Objective:** to make the user aware about how to defeat the corona virus.

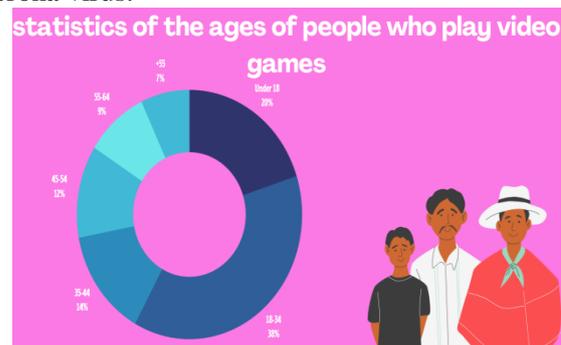


Figure 9. Users statistics

How to play?

It is played using the VR device and Bluetooth remote control then the game starts and when you skip a level you will moves to the next level.

**Level 1:** in the beginning there will be an introductory level the introductory level contains the mask icon this icon helps to increase the score this level will explain to the player how to play.

**Level 2:** In a hospital located in china, there will be an icon for the corona virus and the player must not touch it. The second level contains the corona virus icon, the icon, when touched, reduces the health of the player in the game.

**Level 3:** In a hospital located in Italy some icons are provided with precautionary tools to avoid infection with the corona virus. The third level contains the icon of sanitizer and the mask icon when the player touches these icons, the score will increase.

**Level 4:** hospital located in USA. At this level, the game is provided with a vaccine that helps the player to avoid the virus completely. Fourth and final level contains the vaccine icon this icon helps to raise health.

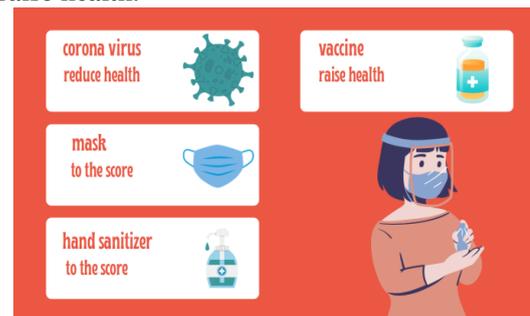


Figure 10. Game levels and instructions

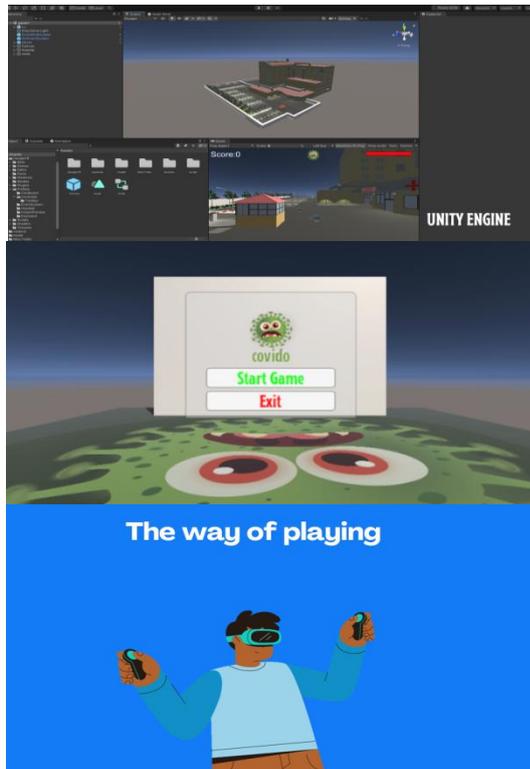


Figure 11. Game start point and environment

### Third game:

The game story is about a rabbit that is hungry and needs to reach to the carrot in order to eat, so in the game he must go through a series of level to finally reach it and eat it.

The target audience will be from 5 to 12 year old as this game is built for kids. But some people from age 14 to 20 will find it fun and enjoyable so some of this demographic might play it. But the main focus is the kids demographic.

The goal of the game is to improve the focus ability in the kids and make them learn to be patient to get the prize. The objectives of the game is to reach a high number of downloads and to be popular.



Figure 12. Here you click start-to-start playing



Figure 13. The starting point of the level



Figure 14. The rabbit collected hearts and you will see the heart counter increased



Figure 15. When the user complete the level

### Forth game:

#### Objectives and goals

- 1- for the player to have fun
- 2- to strengthen hand-eye coordination

**Target audience:** mainly gamers between the ages of 18-34 years old and above, as this game is suitable for all ages. The survey results show that Ages from 18 - 34 are playing games with average 48.1%

Game idea: 2 twins got separated and one of them is killed, the other went out to seek revenge and must complete 4 levels to collect 4 stones in order for the 5th level to be open and boom there is her sister being controlled by a necklace and after wining against her sister they both fight the big boss and take him down together to bring peace to their people.

#### Character description

Ivy – the main character, one of the twins who is seeking revenge for her other twin. Mareshka-secondary character, the other twin that was supposed to be dead but is discovered later on that she was alive.



Figure 16. First avatar

We eventually decided on the black-on-black option and grey hair to be easy to blend with the colors of the different levels and not be too many colors.

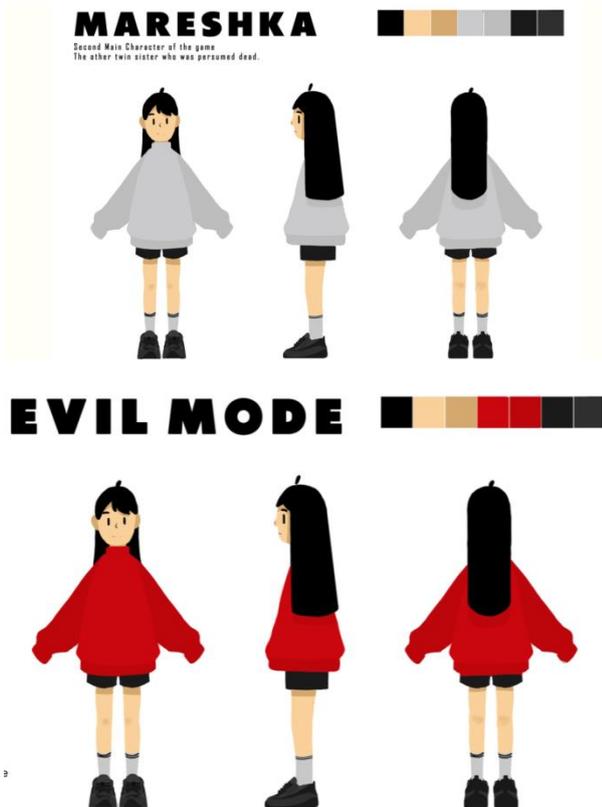


Figure 17. Second avatar good and evil mood

As we mentioned in the last slide, we switched both of IVY's colors to convey the relationship of the twins.



Figure 18. Monsters levels

Level 1 description: This is going to be an introductory level where the player will learn how to play and to control the character and to what happens when fighting a boss monster.

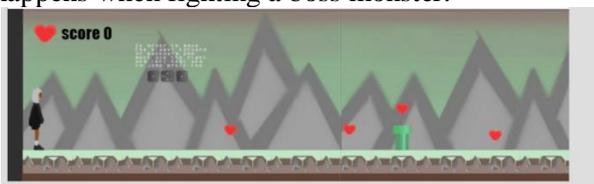


Figure 19. Game level and environment

**Rubric Design:**

In this part the criteria for evaluating the use of Gamification experiences in this course will be defined based on five criteria, each of these concepts will be redefined to match the educational goals. Also this amount will help in covering all-important factors and make the final grade easily calculable. These factors will include the following:

- 1- Challenge: The concept of challenge is one of the main characteristics of any motivating environments for games. There are four variables will defined the challenge level in Gamification (multiple goals, difficulty of levels, game information, and randomness), which will be the weight on defining both goals and performance.
- 2- Fun Factor: “The kind of complexity and fun that is motivating the learners is not a matter of increased information rather than involves the students” this part will evaluate detailed progression suitable for writers and level designers.
- 3- Creativity and Fantasy: these factors will depends on the user’s use of the skills but not vice versa. This will evaluate the graphics or objects used reflect the designer's exceptional degree of creativity and skills.
- 4- Design and game structure: how to transform the information into a more practical approach this part will evaluate the final product. Also by examining how different variables interact with one other; and how they students will apply the Gamification framework.
- 5- Dynamic Environment and Story/Level: this part should respond to the user’s activity in many ways, “An environment should be both responsive to the learner’s activities and helpful in using the information that produced in the E-learning environment.” Environment refers to surroundings that affect the student when working on a specific activity. Story/Level conveys a detailed progression and evaluate if it will be suitable for writers and level design.

All rubric criteria have been defined for the evaluation process, as described in Table 2.

Table 2. Evaluation rubric

Category		
Challenge		
<b>Excellent</b> Attracts the gamers attention and Conveys high level overview	<b>Satisfactory</b> Is somewhat attractive. Explains the required Elements of the world but to no depth.	<b>Poor</b> No effort on testing on gameplay and skimming over the required elements.

<b>Points</b>			/20
<b>Category</b>			
Fun Factor			
<b>Excellent</b> This game is fun, and clear description of the player interaction and a good working of the game.	<b>Satisfactory</b> This game is kind of fun, clear in the inner working of the game as rules instead of mechanics.	<b>Poor</b> This game is all right. In playing with missing description of the inner workings of the game.	
<b>Points</b>			/20
<b>Category</b>			
Creativity and Fantasy			
<b>Excellent</b> All graphics and objects used reflect the designer's exceptional degree of creativity with Great use of formulas and figures.	<b>Satisfactory</b> Some of the designer's graphics reflect skill also some use of formulas and figures.	<b>Poor</b> Only one or two graphics showed skill or creativity level also a little-to-no use of formulas, and figures.	
<b>Points</b>			/20
<b>Category</b>			
Design and game structure			
<b>Excellent</b> Clear and concise, ideas are creative and inventive.	<b>Satisfactory</b> Pretty good, though there is something missing description	<b>Poor</b> Unclear diagram of each user interface without an accompanying description.	
<b>Points</b>			/20
<b>Category</b>			
Dynamic Environment and Story/Level			
<b>Excellent</b> Level Design is well done and clean. Shows a large amount of originality	<b>Satisfactory</b> Level Design is pretty good, shows new ideas and insights	<b>Poor</b> Level Design is okay, Conveys no or a disconnected Level progression	
<b>Points</b>			/20
<b>Total</b>			/100

### **Results and discussion:**

According to the Peer assessment evaluation:

Fist design, shows excellent level in designing and Dynamic Environment and Story/Level, and Satisfactory level in challenges and fun factor, with poor level in Creativity and Fantasy with total 70%. Second and third design, shows excellent level in designing Dynamic Environment and Story/Level, and excellent level in challenges/ fun factor, and also excellent in Creativity/ Fantasy with total 90%. Forth design, shows excellent level in designing Dynamic Environment and Story/Level, and excellent level in challenges/ fun factor, and also excellent in Creativity / Fantasy with total 100%.

All of these games apply the Gamification framework that described earlier in this paper, we can see in the fourth design it includes Gamification use and some of the most popular methods of implementing badges, experience points, levels, and leader characters to encourage engagement.

### **4. Conclusion:**

Students have a need to compete, ultimately succeed and collect, on other words Gamification targets that need. It helps them our students with simple information content such as quiz with a points system or with assignments, by using different learning environment like E- learning. We find that using Gamification is appropriate for certain types of learning and if done properly, Gamification can provide cautious feedback and build personal growth.

The use of Gamification in E- learning environment is also linked to simulations and serious games levels. Both of them use the main concepts and structures of gaming in order to help students reach their learning outcomes.

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