Application of Gamification on Remote Teaching for Theoretical Specialization Subjects in Faculties of Engineering and Arts

Applied on technological subjects (Materials – Floors – Walls – Roofs)

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Abstract

Games are a key feature in human life because it provides players the joy of winning and receiving rewards, thus; people always seek to collect these rewards especially when they need a motive to complete their tasks.

The term "gamification" has been recently introduced, which is based on motivation using game elements in contexts that are unrelated to gaming, such as marketing, education, work environments …etc. Studies have found that game-based education based can positively impact the students' problem-solving skills and stimulate their knowledge gain and sharing.

Despite the importance of practical subjects in interior design field, the study analyzes and applies the concept of gamification in higher education and shows its impact on teaching the theoretical interior design subjects remotely.

The problem of this study came from the Covid-19 pandemic and its rapid spread, resulting in the transformation of the teaching method in some universities around the world; from direct communication between students and professors within campus, into a virtual community that remotely gathers professors with their students. This situation has decreased the ability to communicate and comprehend, thus; it minimizes the professor's ability to determine how well the scientific content was delivered to their students; and how well have they conceived it.

The objectives of the study are to obtain positive outcomes from remote learning in faculties of engineering and arts and to realistically highlight the research done in the field of gamification-based education, by focusing on experimental evidence rather than beliefs or preferences; with the purpose of achieving progress in education through games.

The significance of this study is that it presents challenges, promotes the students' pride of their achievements, and identifies modern education techniques, in order to improve the knowledge gain, scientific content comprehension and motivation for the students in the faculties of engineering and arts.

The study concludes that utilizing gamification in higher education results in a behavioral change of the learners; it also supports knowledge retention and makes learning more enjoyable. The experimental methodology was used in this study, by teaching the theoretical curriculums of interior design to university female students using the gamification method; followed by a questionnaire to identify the comprehension level of the scientific content.

Keywords:
 gamification, games-based learning, electronic education, remote education

الملخص:

تعتبر الألعاب جزءا هاما من الطبيعة البشرية، فاللعب يحقق للإنسان متعة الربح والحصول على المكافأة، لذلك فهو دائم السعي للحصول على تلك المكافآت، وقد ظهر حديثا مصطلح التلعيب، والذي يقوم على التحفيز من خلال استخدام عناصر الألعاب في سياقات غير متعلقة باللعب، مثل التسويق، والتعليم، وبيئات العمل، وغيرها.. وقد وجدت الدراسات أن التعلم القائم على الألعاب يمكن أن يؤثر بشكل إيجابي على مهارات حل المشكلات لدى الطلبة، وتحفيز اكتساب المعرفة والمشاركة لديهم. وعلى الرغم من أهمية المواد العملية إلا أن تلك الدراسة تقوم بتحليل وتطبيق مفهوم مصطلح التلعيب في التعليم العالي، وبيان تأثيره على تدريس مواد تخصص التصميم الداخلي النظرية عن بعد، وتكمن مشكلة البحث في تسبب وباء Covid-19 وانتشاره السريع في تحول التدريس في بعض الجامعات حول العالم من علاقة تواصل بين الطلبة والأساتذة من خلال الحرم الجامعي إلى مجتمع افتراضي يجمع الأساتذة بالطلبة عن بعد بشكل قلل من فرص التواصل والاستيعاب، وبالتالي عدم قدرة الأستاذ على تحديد مدى وصول المادة العلمية للطالب ومدى استيعابه له، بينما تتحدد أهداف البحث في تحقيق نتائج إيجابية في التعلم عن بعد في كليات الهندسة والفنون، وإلقاء ضوء أكثر واقعية على البحث في مجال تطبيق التلعيب في التعليم من خلال التركيز على الأدلة التجريبية بدلاً من المعتقدات أو التفضيلات بهدف التقدم في التعليم عن طريق الألعاب، بينما تعود أهمية البحث لطرح التحديات وتعزيز فخر الإنجاز لدى الطالب، والتعرف على تقنيات تعليمية حديثة بهدف اكتساب المعرفة المحسن وإتقان المحتوى والتحفيز لدى طلاب كليات الهندسة والفنون. ويخلص البحث لأن استخدام التلعيب بالتعليم العالي يؤدي إلى التغيير السلوكي للمتعلم، كما يعزز الاحتفاظ بالمعرفة، ويجعل التعلم ممتعًا.

الكلمات المفتاحية:

التلعيب، التعلم القائم على الألعاب، التعليم الإلكتروني، التعليم عن بعد

Research Aspects:

The first aspect discusses the definitions of active and inactive learning.

The second aspect discusses the aspects of games, elements related with games, the relation between gamification and learning and how to apply gamification on higher education.

The third aspect (the practical aspect) studies the overall effect on the participants of the courses, accomplished by applying the different game elements.

The fourth aspect includes conclusions and recommendations

Introduction:

Contrary to older generations; today's youth are raised to be familiar with digital development and looking for all new things. This has promoted the general belief that their ability to concentrate are limited because they have to multitask, also; it has become preferable to deal with both visual and interactive aspects, so it has become essential to make a core change in educational institutions to adapt with this generation that is highly linked to the internet.

Games-based education is a relatively old phenomenon, and its roots go back to the seventies of the past century, yet; the first use of the term "gamification" was in the year 2008, then the now-commonly-used terms started to appear in 2010. After only one year, gamification has become an approach that can be applied on a wide scale, this is because of the conception that games are capable of supporting motivation, behavioral changes, friendly competition, and

cooperation; in various fields apart from the context of playing, such as marketing, human resources, education, training, environment protection and welfare.

Gamification method uses games elements to transform learning into a game, in order to teach a specific skill, achieve an educational goal or use educational activities to provide learners the opportunity to gain new knowledge or a number of skills in an enjoyable and appealing method, based on specific rules and objectives that present students to concepts of winning or "losing" in case of participation (Snežana Šćepanović, 2015) (Sujit, 2021) (Luis R. Murillo-Zamorano Subhash, 2018).

First aspect: active and inactive learning

Inactive learning (Passive learning): It is a method of learning or teaching, through which the student receives and processes the information from the teacher directly, by observing data, information, and figures.

In this case, the student gains knowledge through repetition, memorization, and memory exercises, which might; sometimes; be done without actual comprehension of study content. This type of learning revolves around the teacher and contradicts with active learning, which revolves around the student (Sega Team, 2016).

Active Learning: It a process in which the students participate in education activities, such as reading, writing, discussion and problem solving, which enhance analysis and evaluation of the course curriculum. Thus, this is a cooperative and experimental learning, it is an attentive and appealing method which is based on the student's ability to solve problems; it enables them to discover several learning experiences that might be more affective and interesting, by utilizing simulation methods which supports active learning, thus; the student's ability to hold the responsibility of learning (CLRT, 2021).

This method is conducted using some techniques, as follows:

1- Pull method: This technique is conducted by the teacher who asks the students some questions, with the purpose of adding new learning outcomes for the learners and motivating them to interact with the teacher.

This technique is better used when the teacher is sure that the learner knows the information, because in the case of a new content, the teacher cannot attempt to pull the information from the students, as this might affect the safe learning environment; if the learner shared wrong information, they might forever withdraw from participation.

2- Push method: This technique is used when the teacher adds a new content which is directly addressed to the students. Afterwards, the teacher can diversify in using the pull and push techniques, allowing the learners to participate and present.

3- Intentional partial loss of control: This is one of the main concepts in active learning, which the teacher can apply by trusting their students' experiences and capabilities. This can be done through direct questions (pull technique) or by utilizing various learning and experience activities, in order to stimulate the students and encourage them to participate throughout the course, as well as providing them with guidelines through activities and discussions (Sega Team, 2016).

4- Consideration of the level of attention: The teacher must take into consideration the period of time during which a person can stay focused on a specific activity or subject. The average

attention time of an adult ranges between 10:15 minutes; this duration can increase as long as the activities conducted by the student are interesting for them.

The process of active learning is conducted through a number of basic activities called experience activities, which are the activities used to support the active learning experiment, in order to support knowledge, improves the learning experience and increase the number of participants (Sega Team, 2016). These activities can be categorized as follows:

* Introductions: Which are a method used to activate the learners' previous knowledge and involve them in the learning process, in order to develop a learning objective. A lesson introduction can help students focus on the work ahead of them and provide them with the information they have already acquired regarding the subject; it also helps them decide their personal path for new learning in the future (E3T, 2013).

* Closure: This is the method by which the lesson is ended, which leaves a permanent impression. Using an appealing closure activity at the end of each learning activity can achieve its objective and create what is called by psychiatrists "the regency effect", known as the last impression; this can also support what the students have learned (Finley, 2015).

* Activation: This is an activity that aims to increase the energy within a specific group; through interaction with its participants using a physical activity, a funny content, or methods that cognitively include the students in problem solving (The Training World, 2019).

* Mission: It is an educational activity that expresses the work that should be done by the learners; whether during or after the lesson; as it helps the students to apply what they have learned, in addition to giving them the opportunity to practice the new concepts or skills (Sega Team, 2016).

* Connection and summarization: an activity that depends on summing up the educational content throughout the school day, using different methods and establishing connections between them; in order to facilitate remembrance and recollection of the study content (Sega Team, 2016).

Active learning also depends on supplementary activities, as one or more of its techniques can be utilized to achieve the highest benefit, such as simulation activities, cooperative learning activities, short presentation, and educational games.

Although formal education includes a combination of educational activities and supporting materials, e.g. lectures, home works, projects, exams, exercises and group work; yet, online education probably needs a stronger motivation so that it can encourage students to interact, which makes it a relatively promising field to apply active learning activities. The objective in this case is to include the students in a more organized interactions with the learning environment, motivate them to learn through experiment and retrying without fear of negative outcomes; it also enables teachers to evaluate the student's levels of recognition (Luis R. Murillo-Zamorano, 2021).

Therefore, this study discusses the application of the game mechanisms; as a method of active learning; on online presentation of university study content, by applying the gamification method and its elements; which differs from education based on games, as explained in the following aspect.

Second aspect: games – games-based education– utilizing gamification in higher education

The concept of games: It is difficult to identify a specific definition for games, but it can be defined as an international part of the human experience which exists in all cultures and has various types. All games have three fundamental properties: specific rules, speedy reactions, and established goal. Games are similar to education in that both of them aim to discover new worlds; within the game or new subjects of study; and achieve points and badges or scores and awards, as well as social interaction between the players or the students and raising the cooperative and competitive spirit among them; in addition to learning from failure and having a timeframe and pressure that pushes the player or student towards accomplishment (Wang, 2020) (World Government Summit, 2016).

Games-based learning

This is a type of active learning experiments conducted within the game frame line, it has specific and measurable educational goals; as it gives the student clear and difficult goals to achieve within the context of a virtual game, which requires a high level of the students' interaction.

The games-based learning demonstrates a connection between stimulation, participation, complicated problem solving and other social emotional skills; it also depends on learning from failure and the transformation from the fixed mentality to the growing mentality. A student with fixed mentality thinks that intelligence is inherent and unchangeable; while the student with growing mentality thinks that they can change and improve their knowledge through hard learning. The nature of learning from failing and mastering a game allows a natural improvement for the growing mentality (Wright, 2018).

The concept of gamification

The terms "game-based learning" and "gamification" might appear to be similar, substitutable and interchangeable; as both combine between the term's "games" and "learning"; but the difference comes from the way by which the game elements are integrated in the learning experience, this distinction leads to a bigger differentiation when comparing the learning outcomes of games-based learning and gamification (Wright, 2018).

Gamification is an old practice and a relatively modern concept at the same time; it includes a number of theoretical and experimental knowledge, as well as technological platforms. It is actuated by a number of practical motives in an attempt to obtain the core of the fundamental concepts and practices in a better way; and to make activities closer to being games, by using the elements of game design in contexts that are unrelated to games, with the aim to stimulate and create enjoyable experiments.

The empirical work with gamification was initiated in different specializations in order to recognize its behavioral and experimental effects on humans, on both short and long terms.

The field of education is one of the key sectors that demonstrate the effect of gamification due to its stimulation capability, which is an important factor in the students' academic achievements, consequently affecting the effort and time spent by the student in the learning

process. Games are known for generating motives and sharing; this is the reason behind its popularity (Luis R Murillo-Zamoran, 2016) (World Government Summit, 2021).
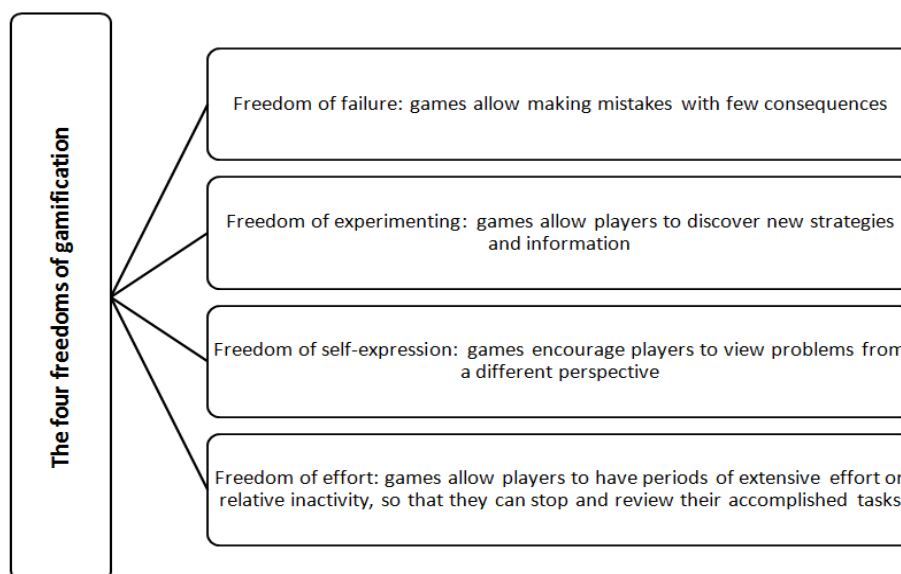
Gamification of education

Teachers has started to discover the possibility of developing new methods to transform the teaching and learning process into games; to make it as spontaneous and enjoyable; by applying the elements of the game design and its interesting experiences.

Therefore, learning processes are designed and educational situations are developed; that are unrelated with games; to stimulate the student's behavior, strengthen their creativity, obtain cooperative paths, improve self-oriented study and complete tasks; as well as to facilitate evaluations and make them more effective and to integrate exploratory approaches of learning. This creates an immersion in the learning process similar to playing games, because the integration of the game mechanism in designing the learning process results in including the participants in a productive educational experiment and changes their behavior in a desirable way.

Gamification is not just a technique; it is also a methodology embraced by some organizations as a method to increase motivation. Dr. Christopher C.; School of Medicine – Manchester; has shared during the TEDx event his notion regarding the confusion that might occur in some minds when he speaks about his innovative educational projects and their connection with games. This was when he highlighted his project "Escape room feature" which he applied on his students at the school of medicine. In this project, he applied the concept of the "escape room" on his students, it was based on developing a number of puzzles and challenges, and at the same time providing a number of keys to help them solve these puzzles. Solving one puzzle leads to another one and a new key appears to help to solve the following puzzle until the player reaches the end of the game and escapes from the room. His goal was to simplify the hard-to-remember medical terminology by a number of mental processes and thoughts connections; this means that his intention of practicing gamification wasn't to just spend a joyful time while playing; but to create a basic structural integration between what is done during the learning process and what is done during playing games. Thus, he transformed his boring or hard to comprehend study curriculums into games that are easy to understand by the students; and at the same time; help them remember the difficult information at any time because of the funny method it has been formulated, because the student must focus on the details rather than on the game (Luis R. Murillo-Zamorano, 2020) (See, 2016) (Wang, 2021).

 The popularity of gamification in education comes from the four freedoms which it provides to the students and teachers: freedom of experimenting, freedom of failure, freedom of effort and freedom of self-expression. These freedoms represent an educational transformation which is welcomed by the students whose learning capabilities are hindered by the traditional teaching methods. Yet, these freedoms can be hard to achieve due to the many obstacles that might get in the way of practicing gamification, for example, the attempts to apply gamification in education might fail because of parents' objection, student's loss of interest or bad application due to lack of experience (World Government Summit, 2016).

Fig. (1): The four freedoms of gamification

It is difficult to change the thinking and behavior methods, the reason that some learners can memorize the information taught to them; while others can't; is a chemical produced by the brain called dopamine, which is produced when a person has the feeling of happiness, winning or achievement; or when receiving a reward or participate in a new experience; this chemical must exit in large quantities in order to maintain information (Takabori, 2021). In this sense, the application of gamification in higher education aims to stimulate students to self-learn with better efficiency, in addition to enhance their desire for social communication, learning, proficiency, competition, achievement, self-expression and selflessness; by immersing the students in contents of the study curriculums and develop inner positive attitudes towards study. Furthermore, gamification in higher education facilitates building connections between the students and the faculty members through encouraging cooperation and competition between them, taking into consideration the social dimensions of teaching and learning, whether the teaching is conducted in presence or remotely, thus, transforming the learning process from a hard mission into an enjoyable and rewarding one and providing the students with the joy of learning (Pandey, 2020) (Wang, 2015).

Gamification can be practiced in education and educational activities can be designed as gaming activities through the application of the main features of games, such as activities that focus on the objective, rewarding methods and advancement follow-up. Game activities usually concentrate on an objective with a specific number of events and accomplishments, in addition to a number of obstacles that have to be overcome in order to complete the activity. For example, the game can be generally organized so that players have different "levels" of objectives, the requirements of each "level" keeps getting harder until the game ends, this allows the player to learn and practice skills before they have to prove their mastery in these skills in the most challenging parts of the game. Games can be replaced by teaching and learning, players can be changed to students and learners who are stimulated to accomplish study tasks and achieve the required outcome in order to move on to the following level: in the case of a game; or to fully comprehend a complicated study subject in the case of the education process (Snežana Šćepanović, 2015).

Elements of gamification

There are several ways by which the power of games can be utilized; and gamification can be integrated; into higher education in order to achieve positive outcomes. By implementing games elements in the educational activities, such as experience points - XPs, leader boards, competitions and badges, which makes learning more interactive, immerse the students into the study content and increase the opportunities of applied learning. Elements of game design which are used to create gamification scenarios can be categorized as follows:

1- Dynamics: These are the game pattern; they represent the higher conceptual level in the stimulating system. They are created by the application of specific mechanisms and in response to the reactions of other players; or the expected reactions; based on the inputs and outputs of the player over time.

Dynamics mostly depend on interactive simulation processes, which are not an academic subject in themselves; but they express a number of tools that provide new potentials to support the students' comprehension of dynamic processes and systems.

Dynamics include limits, emotions, narration, advancement, relations and challenges, as well as the opportunity, competition, cooperation, feedback, acquisition of resources and rewards.

2- Mechanical elements: These are the rules resulted from the interaction within the system, they are identified through the game contents, as well as the mechanisms of behavior and control; and identification of the procedures which the user can execute within the game system in order to achieve a specific goal while following these rules, such as:

- Gradual progress system: They are the subsidiary goals and challenges which are added to the game with the purpose of solving its problems. They are called tasks or levels, which are explained and set in layers representing additional challenges to the player, and in many cases; they are introduced as separate rewards. This model can be applied in education; whether on short or long terms; in such a way that the mission is not too easy making the learner get bored; neither too hard making them feel exhausted.

- Rewards: These are the most common game elements, as playing strategies give rewards to the players who accomplish the required missions to attract them to the game, such as rewarding them with additional points, accomplishment badges, advancement to higher levels, filling up the advance bar or giving the player virtual currency. In some cases, rewarding players by allowing them to complete visual missions of other players, or by publishing leader boards with the players' names, can be effective ways to encourage players to compete with each other.

- Tutorial and enhanced accessibility: These are the elements responsible of guiding the players through the first few minutes of the game, with the purpose of demonstrating the concepts that form the game levels in order to facilitate completing them.

- Immediate reactions: The outcomes of the player choosing a specific action during the game are clear when they make the decision.

3- Personal elements (components): These are the main level of gamification; they refer to the game elements and include:

- Badges: These are the visual accomplishment symbols and are called a badge or higher level, their purpose is to provide more intermediate goals, to ensure that the player does not focus on the final goal only.

- **Achievements:** These refer to the rewards that the player receives when they complete a specific mission in a specific way; they are considered as secondary goals for the main goal of the game. Achievements can be publicly displayed to the students; or can be recorded without the student knowing whether they have achieved the expected targets or not until they receive the final score at the end of the school year.

- **Points:** Points are used in games to record performance and achievements; playing the game with the aim to acquire points in order to "win" is so much similar to the students' attempts to acquire grades to succeed, thus; the easiest way to integrate points is to link them with the game levels.

- **Levels:** Levels in the study course can be regarded as the lessons or educational units, also; levels can be linked with the difficulty of the game, as well as using them to categorize the students' activities.

- **Leader boards and lists:** These are players' grading lists according to their success in the game, for example, the student's scores are the points given to them as a result of being mentioned in the leader board.

- **Symbolic images – groups – leader boards – ranking …etc.**

4- Game storyline: The storyline of the game represents the goals, obstacles and struggles which the player faces within the game system; this element is a key part of the stimulation process; as each integrated system must have a clear goal that must be achieved by the player, as well formulate the user's journey within the game.

5- Emotional elements: Especially the status of psychological flow.

6- Game aesthetics: The aesthetics of a game play a main role in the player's experience of the game. Aesthetics represent a group of presentation tools which include the information needed for the player to attempt to control the game processes, therefore; aesthetics are considered a key part of the stimulation system, because they are the player's point of contact with the game as they observe them (Pandey, 2020) (Wang, 2016) (World Government Summit, 2021) (Snežana Šćepanović, 2015) (Luis R. Murillo-Zamorano, 2015).

The elements mentioned above can be summarized in a clearer way as follows: points availability, badges (components) and rewards (mechanism) to provide a sense of advancement and encourage competition between students; (dynamics) through a motivation story (storyline) within an appealing aesthetic frame line (game aesthetics) to create a state of psychological flow among the students (emotional elements).

Techniques used to apply gamification on education:

The techniques used to apply gamification in education can be categorized as follows:

1- Low- or non-technical gamification activities, which are divided into:

- **Activities with short-term techniques**: They are gamification activities distinguished with its accessibility, as using them doesn't require any digital devices as it only requires a minimal explanation by the trainer. It includes a various number of low-risk participations throughout the course, such as creating warming-up activities for the class, revision games and interactive games.

- **Activities with medium-term techniques:** These are activities that take longer time to prepare, such as individual and group research activities, setting strategies and submit

discussions. Such activities require that the students creatively benefit from the common communication tools, enhance their cooperative skills, and find an effective way to collect the work of the required research.

- Activities with long-term techniques: These are activities that encourage students to work using a number of digital devices that can be controlled as virtual spaces for remote working, in order to create a cooperative writing environment, practice individual writing and share comments and ideas, such as Google documents, Google charts, Lucid charts …etc.

2- Medium-technical gamification activities:

- Activities with short-term techniques: These medium-technical activities can be used in evaluations, revision exams, introduction activities, interactive ideas and collecting opinions. This type of activities can be likeable for the students, which helps preserve their attention and stimulation, one of most important techniques in this type is UChicago Poll Everywhere, which includes a free issue for universities.

- Activities with medium-term techniques: This type of games can be used before, during and after the study course in various ways which enables the students to stay in connection with the content of the training course. These activities include web-based games available for educational use, such as the "City of words" game presented by Goethe Institute for German language education. The trainer or teacher can inspire from such games to develop ideas for similar games that are specifically designed to meet the students' needs and provide them with a different educational experience.

Such activities were also used in the field of teaching foreign languages; as three language trainers at the University of North Western have developed 03 training courses for Arabic, Hebrew and Turkish languages based on famous cities; Cairo, Jerusalem and Istanbul; they have substituted books as the traditional educational tools with original texts and various multimedia sources, they also accompanied the study content with creative exercises for language learning using various digital tools, in order to support the students' language perfection on one hand; and expand their knowledge on the other hand.

These activities were also used in the "Arté Mecenas" game, which is a simulation game developed to help understand arts and recognize how artistic works were created during the Renaissance era in Italy. In this game, the student is engaged in a simulation of banking business as a member of the "Medici" family, their main goal is to expand their fortune through transactions of artistic works and goods.

3- High-technical gamification activities

- Activities with short-term techniques: The previously mentioned "escape room" activity is an excellent example; it was designed by the medical trainer Dr. Christopher C.; in which he developed the puzzles inside the escape room with the purpose of helping the students remember the study content of his course (The cardiovascular system). This activity was of a great success; even outside of their university; and although the challenges designed by Dr. Chrisopher C. were digitally complicated, yet they were moderate and fast.

The "Peters Township" public library developed a game inspired by the "Harry Potter" storyline using Google forms, without the need for tangible space or props. Generally speaking; designing the "escape room" activity by the teacher requires a thorough thinking and planning

process, as well as a considerable amount of comic books backgrounds, and an appropriate method to utilize them in the tests.

- Activities with medium- to long-term techniques: The role-playing game "Reacting to the past – RTTP" is a distinct example for this type of activities. It is a primary game, in which the students are assigned to roles of historical figures, and they have to create their own methods to convincingly express their ideas in their presentations. This game grants the student's total control of the learning process, because classes are run by the students themselves; which provide them with an additional motivation to continue learning outside of class, in addition to improving the social aspect of the learning process, because this game requires that students must effectively communicate, cooperate and compete in order to achieve their goals.

- Activities with long-term techniques: Among the examples of this type is the "ECHO" game, which is a game to construct a society which was developed at the beginning of 2020 by the staff of "Fourcast" lab in UChicago, as a result of the COVID-19 pandemic. In this game, students have to complete text and video tasks, which were developed by the faulty members of the university (Wang, 2020).

Used technique	Short-term (One time use)	Medium-term (Regular and repetitive use)	Long-term (Throughout the study course)
Low- or non-technical	Revision games, e.g., puzzles, contests, questionnaires (e.g., Quizlet Live, Kahoot) interactive games (e.g., Mentimeter)	Debates, discussions (e.g., Canvas Discussion, Ed Discussion, Twitter), research activities, strategizing, arguments (Ed Slack, Discord)	Applications interactive writing (Google Docs., Google sheets, Google Jamboard, shared workplace apps.)
Medium-technical	Evaluations and contests to revise the study content Warm-up activities and survey questions	Content-based educational activities designed by the teacher (e.g., Google Suite product, simulation games)	
High-technical	Escape room activities, programmed through websites or Google forms	Response and interaction with previous games	ECHO (Fourcast Lab)

Table (1): Techniques used in the application of gamification on education

The effect of gamification techniques in remote higher education

Due to the continuous development; university students are preoccupied with many things that distract them from education, this leads to the teacher's ongoing attempts to maintain their students' motivation and to keep them focused; as much as possible; on the study course throughout the semester. This situation has escalated after the Covid-19 break through which

forced some universities to shift to remote education, thus; forcing many academic institutes and universities to search for various methods and modern educational techniques to increase the students' participation and maintain their motivation and interest, especially after the online-training has become the new reality. Therefore, different approaches have emerged to stimulate students using a number of methods; and it has become possible to use a series of activities to replace a long video-taped lecture.

Utilizing remote gamification activities can affect higher education in terms of:

1- Enhance the learner's motivation: By applying the stimulation techniques used in gamification, such as challenges and rewards, which help keep students motivated during the learning process.

2- Better students' participation: By making the gamification-based curriculum content more fun and interesting for them.

3- Enrichment of the overall experience: By overcoming the course challenges in an interactive way and replace the traditional evaluation methods with a rewarding system.

4- Increase the duration of interest: By formulating the study content in an exciting way which makes student's more interested in what they are learning (Hurix, 2020) (Snežana Šćepanović, 2015) (Hill, 2020).

The professional and comprehensive preparation of the study content is a key factor, yet; applying gamification elements on the content of remote higher education could require special technical and educational capabilities; first of which are basic technological requirements.

Despite the fact that technology has dominated gaming and games, still; gamification may not need to apply as much technology; it can be considered a contributing factor; as although online educational platforms might reduce the costs of individual learning, they will not allow the teacher to supervise the individual work without using technology. Therefore, having an educational system that can be totally applied online is one of the key aspects in the gamification learning experiment.

Integrating any technical aspect in the study course can be a big challenge, because teachers may lack the knowledge needed for the technology required for using innovational methods in education, which might form an extra burden for them, on the other hand; the targeted students may be used to different levels of interaction with technology, making it boring for some students and hard to others at the same time.

Educational requirements are also an important element for the application of gamification; teachers have to choose the elements that are most relevant to the game presented to their students, these elements have to be continuously applicable, because applying all of the gamification elements at once can prove to be unsuccessful, even precise application will not be common on an international scale. The elements applied should be able to respond to the individual needs of the students when arisen, evaluate the gamification effect in real time and on regular basis, thus, providing flexible study content (World Government Summit, 2016).

Third aspect: The practical aspect of the study

The following part of the study discusses the overall effect of applying different gamification elements on the participants of a study course; by submitting and analyzing two experiments to design a gamification-based study content for remote higher education, this aspect identifies the

utilized gamification elements and which of these elements had the biggest effect on the cognitive and emotional behavior of the participants.

A request was made to the Department of Interior Design and Furniture at the Faculty of Engineering in a branch of the Arab University in a sister Arab nation, the department had started to work remotely due to the Covid-19 pandemic, so; the researcher volunteered to teach the subjects of specialization technology using the gamification method in the education process; and to assess the extent of the students' capability to comprehend the study curriculums and their satisfaction with this teaching method.

In this experiment, the whole course was taught online in a virtual class, and the traditional paths of the curriculums were transformed into a game, by attempting to apply the gamification techniques and elements on the subjects of (Interior design materials technology – Roofs treatment technology) in the first semester as the first educational experiment. Afterwards, participants were asked to answer a questionnaire in order to identify the points of strength and weakness in the first attempt; and then a second new attempt conducted in the subjects of (Floors treatment technology – Walls treatment technology) using other techniques and elements.

Methodology of the study

* In order to be able to identify the effect of the gamification techniques used in the training course in regard to students' stimulation and participation; a measurement methodology was developed using student questionnaires, including a number of multi-choice questions in addition to some questions that allow comments and opinions.

* Student stimulators were used within the learning context, using cooperative learning, educational and simulation games.

* Gamification elements were utilized to stimulate the students and provide them with a sense of enjoyment and achievement.

* A safe educational environment was created to encourage students to participate and experiment.

* The learners' status was changed every 15 minutes through an activity or leisure time; not more than a few minutes.

* The students were given enough time to think about the answers.

First educational experiment:

- Target education level: University level
- Target group: Female students at the Department of Interior Design and Furniture, with average age 19:24 years old.
- Number of students: 50 female students; only 40 have completed the questionnaire.
- Learning environment: Virtual online classes.
- Academic subjects on which gamification were applied: Materials Technology (3rd level), Roofs Treatment Technology (5th level).
- Utilized gamification techniques and elements: Gaming techniques and elements were strategically integrated into the study content planning, using low- to medium-techniques, through the applications: Word –Power point – Google Drive – the university platform.

The course content was formulated by integrating the following elements:

1- Game storyline: The study content was formulated into a story of a train trip driven by the teacher (the professor) in each lecture and the students followed her throughout the lectures.
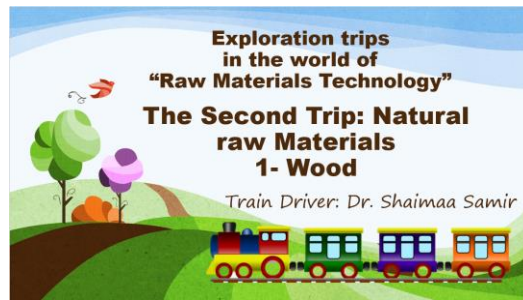

FIGURE 1 THE GAME STORY LINE.

2- Story characters: The professor (train driver) – the students (passengers) – the fictional character "Warda" (a female cartoon character created by the researcher) which appeared to the students at the end of each lecture and could not understand all the information, so she had to ask about all what she involuntarily missed, most of the times; the students themselves explained the difficult topics to her, revealing how well they had comprehend the content.

FIGURE 2 – FIGURE 3 USING AN EXAMPLE OF THE STUDENT CHARACTER "WARDA" TO ENSURE THE DELIVERY OF INFORMATION TO STUDENTS.

3- Interactive simulation processes: This technique was used to develop an interactive environment for the students as each of them imagined that she was travelling by a train.

4- The journey content (study content): The journeys included images and videos which explained the technical topics of the curriculum; they were integrated so that they appeared as if the students were stopping at train stations to learn about the specialization techniques, such as cutting trees and mining marble, or roof installations, in order to achieve the maximum benefit for the student in an attractive way.
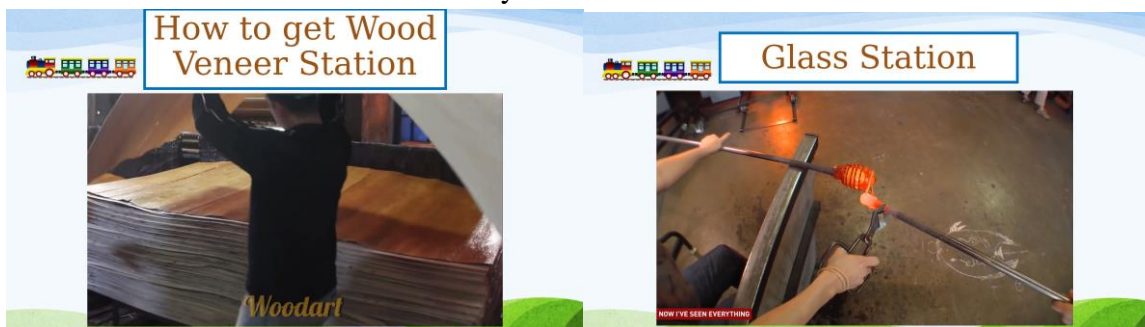

FIGURE 4 – FIGURE 5 THE TECHNICAL VIDEOS IS SHOWN AS A STATION THAT THE TRAIN ARRIVES AT, AS A PART OF THE TRAIN JOURNEY

5- Activities: Individual and group activities were applied to ensure the students' comprehension of the content. Homework was delivered in the shape of tickets that the students had to present in order to board the train. Another activity was included in which the teacher asked the students a number of questions about the lecture content, with the purpose of energizing their minds and prepare them to receive the following information, their answers were rewarded with experience points that were added to their final scores.

FIGURE 6 SHOWS THE MISSION SLIDE, WHICH CONTAINS THE HOMEWORK ACTIVITY.

6- Experience point system - XPs: Students were rewarded with experience points for completing their missions, searching for additional information that was not provided in the curriculum, their presentation innovative ideas …etc.

7- Interaction and feedback.

8- Friendly competition: Group activities were conducted; during which the students were divided into small groups, each has to complete a required task and afterwards; the best project or presentation is selected.

9- Leader board: The leader board was published at the end of the semester after the grading process was completed, in order to share the students' accomplishments and encourage competition.

FIGURE 7 THE FINAL LEADER BOARD WITH THE STUDENTS' NAMES AND THEIR SCORES.

Analytical outputs of the first educational experimental:

As soon as the course ended, a questionnaire was presented online for all the participants; 62.50% of the students thought that the idea of a weekly journey during which the train arrives at different stations; each of them has new study information; was an interesting idea which made them look forward to every weekly lecture, while 37.50% thought that the idea is good but is more appropriate for younger students.

60% of the students thought that the additional points system was an appealing and useful idea; it gave them the feeling of playing a real game, which promoted their enthusiasm to answer questions and participate in the lectures activities; but 30% thought that it was indeed a nice idea, but they did not have the chance to answer or participate because of the over-excitement of other students that made them choose not to participate; 10% mentioned that whenever they did not know the answers; they searched them online in order to obtain the extra points before their peers.

When the students were asked whether gamification should be used again in teaching and presenting the scientific content in a practical method using gaming terms in other theoretical subjects; 77.50% of the students agreed that they liked these ideas and that it would be better if all theoretical curriculums are taught using the same method, while 22.5% preferred that this experiment would not be repeated.

When the students were asked to choose a sentence that most express their feelings towards the whole experience; 57.5% chose "although I wasn't comfortable with online education; but I liked the experience and enjoyed it", 37.5% chose "I really like online education and the subject was very interesting", while 2.5% "I don't like online education and I didn't like education based on gamification"; and 2.5% chose "Very nice; but I felt it is more childish".

When asked about the effect of group work in their final project; 75% of the students expressed their content with the final outcome because working as a team helped in presenting a better project, while 2.5% felt bored and did not want to repeat the experience and the last 2.5% did not have any positive or negative feelings towards the experience.

60% of the students felt absolute happiness because their names were in the leader board published at the end of the course, 35% of the students were happy to see their peers' names on the board but wished their names were included as well; while 5% of the students were not interested in the leader board because their names were not in it.

The students were asked regarding the effect of the videos used to explain specific technologies demonstrated as being at a train station watching the process of cutting wood, or in a factory observing the steps of marble manufacture …etc.; 85% of the students reported that they felt as really being on a field trip which facilitated their comprehension of the subject when studying, while 15% of the answers ranged from "images were better in explanation", "videos made it difficult for me to understand and comprehend the subject", "I didn't concentrate whether they made it easier or more difficult to understand", "they helped me to understand, comprehend and maintain information" and "they facilitated understanding the used technology".

When asked about their opinions regarding the fictional character "Warda" who couldn't fully understand the provided information and had a lot of questions; 50% of the students answered that it was a very good idea because "Warda" sometimes asked questions they wanted to ask as well, 17% of the students said that this idea made them feel that they are not the only people who were wondering about these points, while 28% of the students thought that the idea was good and motivating and 3% did not like the idea because they do not think that there are a lot of persons that ask too much questions in such manner.

Afterwards; a questionnaire was conducted regarding the final activity at the end of each lecture; as the teacher has left a couple of points to be researched as a home work; 85% of the students answered that this activity contributed in learning more information and benefit from researching the information which helped them maintain it more effectively, 7.5% reported that

it did not make any difference because students are supposed to complete any task they are required to do, while 5% did not like it because they did not want to have home works and the remaining 2.5% thought that this method made them feel lost and could not fully understand what they were required to search.

The students were asked about the average level of their comprehension of the scientific content after each lecture, the answers displayed that 30% of the students had an average of 95-100% comprehension, 47.5% had an average of 80-95%, 17.5% had an average of 65-80% and 5% had an average of 50-65%; as shown in the following pie chart.
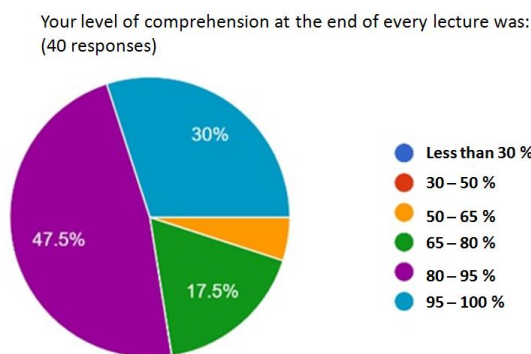
Pie chart (1): Average of the level of comprehension after every lecture

When asked the question "do you prefer those other theoretical subjects be transformed to interactive learning method?" 42.5% of the students answered with (yes), 52.5% answered (maybe), 2.5% answered (yes if applicable with the subject) and 2.5% answered with (no).

The students were also asked if they preferred the way interactive questions were formulated as puzzles or contests instead of traditional questions; 60% answered that this method is enjoyable and more useful and that they prefer it much more than traditional questions; 27.5% though that it was confusing but useful; while 12.5% answered that it was confusing and useless and that they preferred questions to be asked in the traditional method.

At the end of the questionnaire, the students were asked to describe their feelings about studying the subject in this method throughout the course, their answers were:

The experience was very good – it was a nice and fun experience; I liked its teaching method different from the rest of the theoretical subject and I learned new things – I wish you all the best – it was a very enjoyable experience full of useful and entertaining activities – I really benefited from the information; I became more capable of recognizing the specialization techniques; I learned the various options of roof installation enabling me to choose the material most appropriate to the design; the information regarding calculating quantities were very useful and it was important for me to learn – an enjoyable experience which I wish it could be repeated – this experience encouraged us to participate – the method used to explain these subjects was fun an interesting; it changed my perception of remote education and recognize that it is possible to accept it and understand the study content through interactive explanation; the teacher used the perfect method to ask questions and award students with points and she made sure that every student understood the content of every weekly lecture – it was an enjoyable experience; especially the effort of the professor and her attempt to deliver the information by many methods of presentation – it was more of an exciting experience and I always looked forward to attend the lectures.

<u>Second educational experiment</u>:

- Target education level: University level

- Target group: Female students at the department of interior design and furniture, with average age 20:25 years old.

- Number of students: 50 female students; only 46 have completed the questionnaire.

- Learning environment: Virtual online classes.

- Academic subjects on which gamification were applied: Walls Treatment Technology (4th level), Floors Treatment Technology (6th level).

- Utilized gamification techniques and elements: Gaming techniques and elements were strategically integrated into the study content planning using low- to medium-techniques, through the applications: Word –Power point – Google Drive – Google Sheets – Google Forms – AutoCad - the university platform.

Also, the "Escape Room" technique was used in a simplified method throughout the study course; and the course content was formulated by integrating the following elements:

1- Game storyline: The study content was formulated into a story of a sea journey, by a ship steered by the captain (the professor) in every lecture; the students follow the story throughout the lectures, so that they spend every lecture on an island to learn new study content, facing a new adventure by meeting other game characters. The game environment was changed from the first experiment by altering the introduction and avoiding the negative aspects of the first game.

FIGURE 8 – FIGURE 9 THE FIRST SLIDE SHOWS THE SUBJECT NAME, PRESENTED AS AN ANIMATED SEA BACKGROUND, WITH A SIMPLE AVATAR FOR THE CAPTAIN AND HER SHIP.

2- Story characters: The professor (ship captain) – the students (passengers) – various fictional characters based on movies which students of this age like to watch, as well as fictional characters created by the researcher; these characters were:

* The pirate "Qursan Ramadan Abu Hagar": a fictional character created by the researcher; his first name was chosen so that it rimes in a fun way "Qursan Ramadan", Qursan in Arabic means pirate; his last name was chosen in consistency with the materials used in floors and walls treatments "Abu Hagar in Arabic means of stone". This character was a pirate who appeared at the end of every lecture to exert his control on the ship, or take the professor and students hostages …etc., with the purpose of giving the students homework to do.

FIGURE 10 THE PIRATE: QURSAN RAMADAN ABU HAGAR.

* Captain Zizo: a fictional character created by the researcher; he is a young boy who was forced to go on these sea trips because he aspires to become a ship captain when he is older. Due to his young age; he can't understand all information at the beginning, but after a couple of lectures, he starts to adapt to the situation and search for new information which he shares with the students.

FIGURE 11 CAPTAIN ZIZO.

* Jack Sparrow: a fictional character from the "Pirates of the Caribbean" American film series; this character was used in some lectures to complete the activity of a mission. This fictional character was specifically used because its story is closely related with the sea; so, the researcher thought that it can be useful in this educational experience, although she hesitated at the beginning considering that this character may be more appropriate in case of male students.

FIGURE 12 CAPTAIN JACK SPARROW.

* "Moana": a fictional character from the movie "Moana"; she is a girl searching for a mythical stone to save her family. The researcher used this character in the motivation activities within lectures, such as the activity of pull and push; to encourage the students to participate with information about the study content, in the context of helping "Moana" learn all she needs in order to reach her people. Yet, after she learns all the required information, she takes control of the ship and escape with it to find the stone; she requires that the students complete a number of tasks in order to get their ship back.

FIGURE 13 MOANA.

3- Interactive simulation processes: This technique was used to develop an interactive environment for the students; as they imagined being passengers on the ship and that they must save their own lives as well as their peers' lives, by overcoming all the dangers they face on their journey.

4- The journey content (study content): the content that explains the treatments for walls and floors were presented in the form of sea ship which stops at a number of islands to learn the content which was presented in a frame line of identification concepts illustrated by images and videos that explain the technical points of the curriculum, the points that needed more explanation were clarified using Power Point or AutoCad images, in order to achieve the maximum benefit for the students.
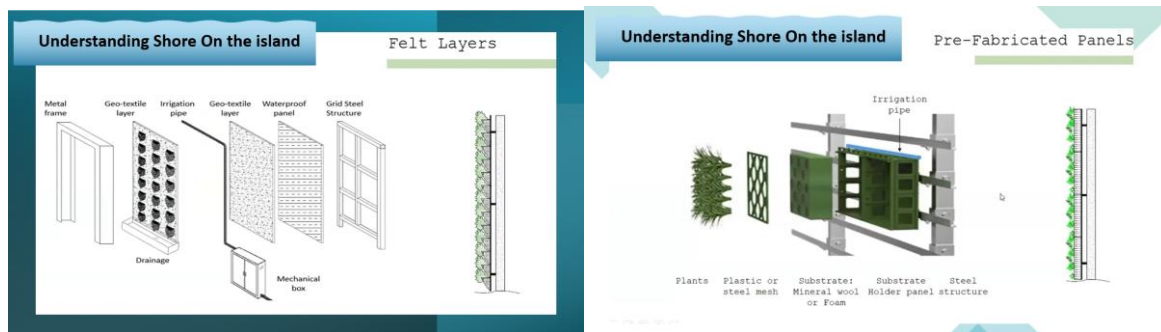

FIGURE 14 USING PHOTOS TO EXPLAIN THE TECHNICAL PARTS OF THE CURRICULUM AS VISITING A PART OF THE ISLAND (UNDERSTANDING SHORE)

FIGURE 15 FIGURE 16 USING VIDEOS TO EXPLAIN THE TECHNICAL PARTS OF THE CURRICULUM AS VISITING A PART OF THE ISLAND (UNDERSTANDING SHORE)

5- Activities: Individual and group activities were applied to ensure the students' comprehension of the content. Number of lecture activities was increased in order to improve the students focus and attention:

* Openers activities: every lecture has a light start to break ice, sometimes by Making sure that everyone boards the ship, other times by inserting a short dialogue between the captain and one of the fictional characters.

FIGURE 17 – FIGURE 18 AN EXAMPLE TO THE OPENER ACTIVITY

* Lecture activities: The lectures were based on the pull & push methods; as information was pulled by asking questions about points that have been already explained to assess the level of students' concentration; or points that were not explained yet to prepare their mind to the following content. This was done using stimulation methods, such as using an image of the keyboard, select a letter using the mouse and the student whose first name starts with the letter has to answer; or choosing the fastest and best five answers, in order to get extra experience points. Then the push technique is utilized aiming to deliver the study content, through a discussion between the teacher and a story character.

FIGURE 19 AN EXAMPLE OF A LECTURE ACTIVITY

* Mission activity: The home work activities were presented within the storyline, for example; sometimes the pirate took over the ship and decided that he will not abandon it unless each student researches a specific subject which is decided by him, other times; he would steal the key of the students' residence on the island and would not give it back unless they research for the answer to a specific question; among other activities which were used in every lecture.
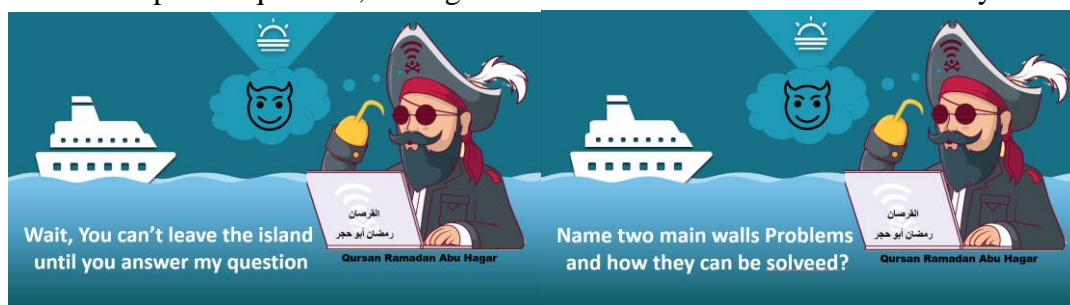
FIGURE 20 – FIGURE 21 – FIGURE 22 – FIGURE 23 AN EXAMPLE OF A MISSION ACTIVITY

6- Experience point system - XPs: Students were rewarded with experience points for completing their missions, searching for additional information that was not provided in the curriculum, their presentation innovative ideas …etc, whether by individual or group activity; as each activity produces a specific number of XPs, thus; students' level advance in the game. The published video on the link https://www.youtube.com/watch?v=KAg4lB6cA5E shows one of the students' presentations that they earned XPs for presenting it.

7- Interaction and feedback: The second educational experiment depended on the interaction and feedback more than the first one; as the teacher was more concerned about increasing the interaction among the students, as well as their interaction with the content; she also was keen on knowing their opinions regularly in order to set objective and monitor the students' advance.

8- Friendly competition: The second experiment adopted group activities more than individual ones. Every class was divided into groups and after the students completed the mission activity; they receive a questionnaire using Google Forms to choose the best research content, best presentation idea and best presentation; to allow a better chance that more than one group come in first place.
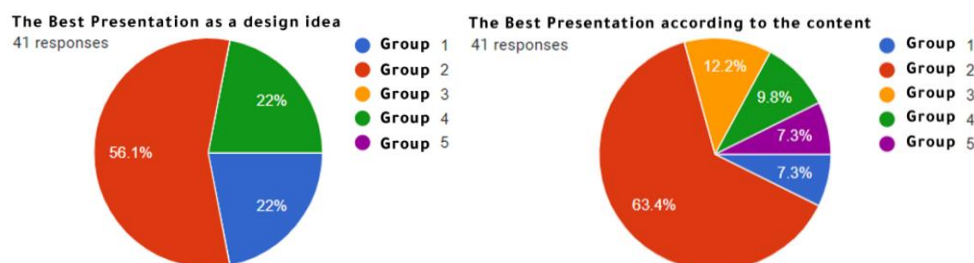

FIGURE 24 FIGURE 25 AN EXAMPLE OF A FRIENDLY COMPETITION SHOWS A GOOGLE FORM RESULTS, AFTER STUDENTS FILLED A SURVEY TO CHOOSE THE BEST GROUP.

9- Leader board: A virtual rewarding system was developed, which positively interacts upon completing the mission. A leader board was published at the end of the lesson to display the names of the students with the best performance during the lecture; the performance is measured by calculating the highest points achieved during the lecture. Because all students were females; nicknames were chosen to comply with their feminine nature, thus; the student with the highest points was called "The queen" and the following student was "The princess". At the end of the semester, after final grades were published; the leader board was used with the purpose of sharing the students' achievements and encourage competition.

10-Rules and objectives: A number of rules and objectives were set at the beginning of the course; they were explained to the students so they can understand the method that shall be

followed throughout the course. For example, the experience points collected upon participating in the lecture are not additional points; but they are fundamental factor in the final evaluation of the schoolwork at the end of the semester, meaning that if the students did not participate enough, they will consequently lose points and vice versa. Also, earning one "Queen" title; or three "Princess" titles; is rewarded with an extra point to compensate for a point lost in the test or attendance; among other rules that were explained from the very beginning.

11- Problem-solving challenges: These challenges were regularly applied through presenting a crisis or problem at the end of every lecture, therefore; the students must search for a way to solve this problem.

FIGURE 26 FIGURE 27 AN EXAMPLE OF A PROBLEM-SOLVING CHALLENGE.

12: Symbolic images - avatars: Each student was required to design a symbolic image to represent her during the training course.

Analytical outputs of the second educational experimental:

As soon as the study course ended; an online questionnaire was sent to the participating students.

Students were asked about their opinions regarding the development of the learning method in the second semester in regards to the idea and content; 83% of them answered that the development was more suitable for their ages; in regards of both the idea and the characters; while 15% thought that the idea was still more appropriate for children, although the characters were distinct and appealing; the last 2% thought that the idea was appealing but still needs more improvement.

When the students were asked whether the improvement in presenting the study content of the second semester has had an impact on their comprehension; 72% answered with "Yes, it really helped me understand"; while the other 28% answered with "Somehow helpful; but it wasn't helpful in other times".

The students were also asked about their most preferred activity during the semester; 56.5% chose the pull-technique instant questions, while 37% chose the group research activities trying to win in the questionnaire conducted at the end of each lesson to select the best group project; the remaining 6.5% chose the letters game, during which a letter is randomly selected and the student whose name starts with this letter has to answer the question.

When asked about their opinion regarding the closure activity and the problem presented at the end of every lecture; such as kidnapping the ship, taking the students hostages, kidnapping the professor or stealing the house key … etc., with the purpose of applying the mission activity on solving this problem, 41.3% reported that it was a great idea because of its suspense factor that

stimulate them to attempt to anticipate the problem that they were going to face in every lecture, while 28.3% said that it was an interesting idea because the learning method using the story telling technique was exciting for them, 26.1% said that they somehow liked the idea, 2.5% thought that it was a good idea but that there was not enough time for them to complete this weekly activity; while 2.5% reported that "it was a very artificial and I did not like it".

The students were asked about their feelings towards group work on researches and projects during the whole semester; 78.3% answered "I originally like group work and being a group-member, and the method used in lectures made me like it more", while 8.7% answered "I originally do not like group work, so it was not interesting for me at all", 10.9% answered "I do not like group work; but the method used to assign missions during lectures made me like it and try to succeed in it", while 2.2% answered "I like group work; but I did not like the method used to assign missions and it made me dislike it".

When asked for their opinions regarding the improvement in the characters utilized in the second semester to be more diversified as well as the structure of the story events to be unpredictable; 65,2% reported that this has made the lecture more enjoyable and their comprehension of the content completely differed from the first semester, while 13% reported that this improvement made the lecture be more of a story; making them look forward to the next lecture, 15.2% said that it has greatly facilitated receiving the information, while 4.3% thought that it made the lecture more like a movie, so they could not comprehend the information due to the many characters who appeared; and the last 2.2% said that the idea was a little boring for them.

The following diagrams demonstrates the students' evaluation of the study content of both first and second semester and their assessment of the used fictional characters; by using a score of 10 points; the diagrams show the noticeable improvement in the utilized learning method and characters.
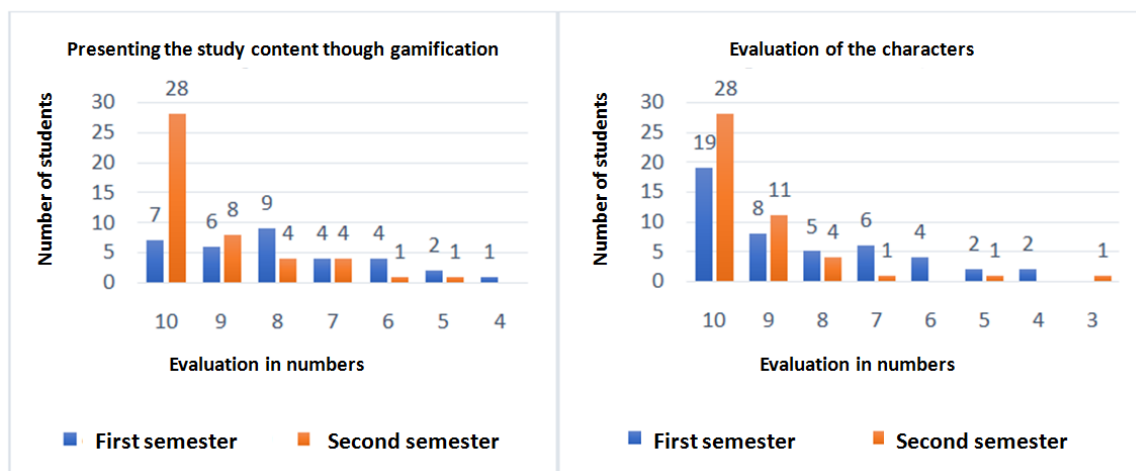

Diagram (1), Diagram (2): the students' evaluation of the study content presentation and the curriculum characters through gamification; in the first and second semester

When the students were asked about the best character that they liked most in the second semester; their opinions were vey divergent. Although the researcher was expecting that the pirates characters used in the storyline may not have the desired effect, yet; the fictional character "Captain Ramadan Abu Hagar" received the highest votes (43.5%), because according to the students it was a strong and innovative character, it has a strange and funny

name and combines good with evil in a comic way; while the character "Moana" came in second place (41.3%), the students said that they think that it is a nice character and because it is from one of their favorite movies, the character "Captain Zizo" received (6.5%) of the votes, the students who chose it said that it reminded them of their childhood; while "Captain Jack Sparrow" the famous character from "The pirates of Caribbean" movies only received (2.2%), which is consistent with the researcher's expectations before commencing this educational experiment, the rest of the students (6.5%) did not like any character, because they have never heard about any of them before.

The students were asked to what extent do they prefer learning by gamification; 52.2% answered that they preferred it only online, while 28.3% wanted it to be applied on theoretical subjects only, while 19.6% preferred applying it in attendance as well as remotely.

The students answered the question "Did the application of gamification elements on the study content have an impact on your stimulation and participation?" 70% of them answered with (yes), 26% answered with (maybe), while the rest (4.3%) answered with (no).

Afterwards, the students were asked about the extent of their usage of computers or laptops; in order to identify the odds of applying the remote interactive education; the answers showed that 69.6% of the students use computers on daily basis, 28.3% only use it when they have homework to do or online lectures to attend, while 2.2% use it in every life aspect.

When asked about the application of interactive simulation, such as being in an imaginary place like a ship, train or island; and whether it increases their comprehension, 43.5% answered with (yes, very much), 47.8% answered with (yes, sometimes) while 8.7% answered with (totally not).
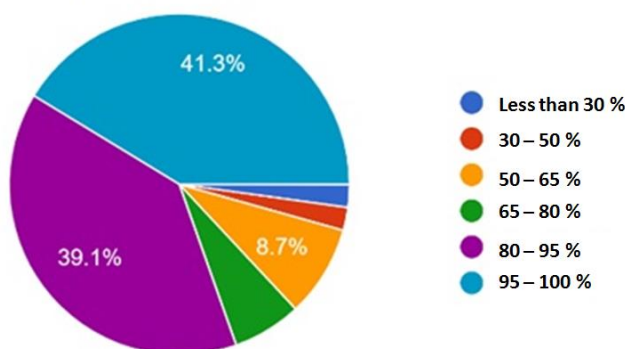
For the question "What was your feeling when the leader board was published at the end of every lecture; and your name was not in it?" 37% of the students answered "I was happy that my name was on the list", 41.3% of them answered "I was happy for my peers, but I wished that my name was among them", 8.7% answered with "I originally did not like the idea", while 2.2% did not care that their names were not in the list, 2.2% did not care that their names were in the list; the rest of the answers were "I felt happy whether my name was on the list or not".

In order to add more details to the above question; the students were asked about their opinions in rewarding the best participant students the titles "queen" and "princess" at the end of every lecture; 78.3% answered that it was highly motivating, 17.4% thought that it was a childish idea; while 4.4% said it was a good idea but it might frustrate other students, so it is better not to add any tiles.

For the question "Have you submitted an avatar when asked by the professor; and why?" the answers were mixed, as 21.7% answered with (yes), 30.4% answered with (no), 37% answered with (I tried but did not have enough time); the answers of the remaining 13% varied from (it was an interesting idea but I did not have enough time), (the professor did not ask for it) or (I forgot).

The following pie chart represents the comprehension level of the students at the end of every lecture; it shows that 41.3% of the students had an average of 95-100% comprehension, 39.1% had an average of 80-95%, 19.6% of the students were less than 85%.

Pie chart (2): Average of the level of comprehension after every lecture

Afterwards, the students were asked about their opinions regarding formulating the interactive questions during lectures as puzzles or contests instead of traditional questions; 78.3% of the students answered that it was very useful and interesting than traditional questions; while 21.7% answered that it was confusing but useful for comprehension.

At the end of the questionnaire, a number of questions were asked with the purpose of improving the study content.

For the first questions "Write down the pros of the study content presentation method"; the students answered as follows:

It was a great method – everything was excellent – I liked the content and lovingly looked forward to the following lectures – I liked the motivation to attend and being able to comprehend in a better way – the method was stimulating and gave me a positive feeling even when I was tired – I liked the way the study content was presented as a story – I enjoyed learning – the interactive method is very interesting – the idea of the pirate was stimulating – I liked the presentation method – fast comprehension because of the method used – the continuous encouragement by the professor – it was good to always encourage competition between the students – the interaction and enthusiasm is appropriate to our ages as young people – the content has become more mature this semester – I liked providing more explanatory videos – asking many questions and the experience points – the education method made me want to participate although the subject might be tough with many information to learn, but this method added flexibility, enjoyment and fun to it – joking sometimes during lectures made me interact more – I liked the characters, presentation method and experience points

The answers for the second question "Write down the cons you found in the content modifications this semester" were:

No cons – too much homework at the end of lectures – the many characters sometimes distracted me – I did not like the activity of choosing students through the letter game, because it could make the student answer without having the background information, which might embarrass her – I did not like the many group work tasks – I did not like the many questions during the lectures – not everyone had the chance to answer during lectures

For the third question "What are your suggestions to modify the study content in the coming years?" the answers were:

I suggest using the game "Who will win the million" or something similar – I wish there would be more stories and characters from movies that we like – no modification because the content

is good – ask more questions in order to receive more experience points – to improve the characters and make them more adventurous, fun and mysterious – to add more puzzles and participation questions – less group missions because home works burdens the students – provide more videos – to modify the method of experience point to allow everyone to participate

Discussion of findings

The first educational experiment used the games elements in the application and execution of gamification, explanation, information simplification, evaluation and motivation.

The researcher noticed the students' obvious desire to improve their study skills and their ongoing attempts to develop new methods to present their work, driven by their sense of competition; they relied on group cooperation and brainstorming to come out with the best ideas.

This noticeable improvement in the students learning level was not observed only in the subjects on which gamification was applied; but their efforts extended to other subjects as well; as they used to personally show the researcher their achievements in other subjects, which proves that their innovation and creativity was not limited in the subject taught by the researcher; but that they could apply these techniques on other study subjects.

The researcher noticed the students' interaction with the content presented as simple stories; as they interacted with the fictional character "Warda" and objected on her name from the start because it did not reflect her personality (warda in Arabic means a flower); they decided to give her a nickname that expresses her personality and excessive depression; so they called her "the perplexed student" as she was always upset and anxious because she could not understand the study content. Yet; the students' strongly interacted with "Warda" in every lecture, as they made sure to explain everything this fictional character could not understand; as if it was a real person.

Despite that the findings of the first experiment questionnaire have shown promising outcomes and positive responses, but there were also some reservations and negative reaction, thus; the researcher concluded that more experimental research must be conducted to identify whether the external and internal motivation of the learners can indeed be affected by gamification or not.

Therefore, the researcher repeated the experiment in the second semester on the same student sample, in order to complete the previous research and compare it with the findings of the second experiment.

In the second educational experiment, the researcher noticed that the game elements displayed as a sea trip were more enthusiastic and motivating for the students. Homework assignments were required to defeat the pirate, the reward and participation questions in this semester was in the form of "speed game" and "letters game", attendance was by asking the students "who wants to board the ship today", in addition to other terms derived from the world of sea and pirates. The study course was narrated from the pirate's perspective, also; students were given the chance to ask questions or express their concerns regarding their mission at the end of every lecture.

The findings of the second experiment showed that the transformation of the traditional educational process into a story frame line; which includes badges and XPs; have stirred positive responses from the students, this was because there is no negative aspects of awarding

a person badges or points for successfully complete a mission; although a balance must be maintained between the effort done by a student and the points awarded to her.

Through the findings of the second experiment, the researcher noticed that some techniques had a more positive impact on the students than other techniques, in regards to increasing their motivation and participation in the learning tasks; in addition to enjoying them; such as the gradual advancing system and rewards. Such techniques motivated the students to try collecting more XPs and badges; they were also very keen to come at the top of the weekly leader board, the findings demonstrated that these boards developed a high sense of competition among the students and enhanced their motivation to achieve more points. Yet; utilizing elements similar to contests; such as scoring boards and leader boards; must be conducted carefully because some students do not like competition; as found through the questionnaire when a student pointed out that students who came least on the leader board can feel frustrated, therefore; it might be better to display the scoring boards within small groups, not among all of the class to avoid weakening the morals of those who find themselves at the end of the list.

It was observed that the motivation techniques used in the second semester helped to highly dissolve the barrier between the professor and the students who were shy to participate; the researcher has also noticed that the game storyline was largely admired by the students, as they could anticipate the closure activity of each lesson when it starts.

The gamification techniques granted the students the option to control the learning process, by giving them the chance to lead the lectures by presenting their group work every two lectures, which gave them an additional motive to keep learning outside the class; in addition to the development of the social aspect of the learning process, because the game required the students to effectively communicate, cooperate and compete in order to achieve their goals. It was proved by the outcomes of the second semester that the students at the end of the semester have comprehended that the main objective of the game was based on their cooperation rather than competition; the main reason was that when students are set into groups, there would be equal chances to participate and contribute in the group work for all students in the same group, including high skilled students as well as those with less skills, only then; competition can take place among all groups.

The findings have shown that the students were pleased with their advancement throughout the whole training course; they have also demonstrated their obvious response to the improvement done to the presentation method of the second semester study content, as well as the fictional characters of the game. Hence, the researcher believes that may be in the following educational experiments, it would be better to develop carefully considered characters with psychological aspects appropriate to the students, paying attention to carefully choose their names in accordance with the study content; or choose characters from movies they have already watched; taking into consideration that female students prefer feminine characters, or complex characters that combine good with evil.

Using the symbolic image (avatar) had a negative to weak impact because they were not among the students' priorities, also; using avatars did not make them participate more in the study course, they thought that creating avatars was a waste of time as well and did not affect their experience.

Measuring the effect of utilizing gamification in the two educational experiments				
Utilized methods	**Experiment (1)**		**Experiment (2)**	
Application of active learning techniques				
Pull method	√	Positive effect	√	Positive effect, except when a safe environment was not provided (random students selection)
Push method	√	Positive effect	√	Positive effect
Intentional partial loss of control	√	Positive effect	√	Positive effect
Consideration of the level of attention	X		√	Positive effect
Application of experience activities				
Introductions	√	Positive effect	√	Positive effect
Closure	√	Positive effect	√	Positive effect
Activation	√	Positive effect	√	Positive effect
Mission	√	Positive effect	√	Positive effect
Connection and summarization	X		√	Negative effect, because not enough time during lecture
Application of game elements				
Avatar	X		√	Negative effect
XPs	√	Positive effect	√	Positive effect
Friendly competition	√	Positive effect	√	Positive effect
Cooperation	√	Positive effect	√	Positive effect
Scoring board	X		√	Positive effect
Levels	X		X	
Badges	X		√	Positive effect
Feed back	X		√	Positive effect
Leader board	√	Positive effect	√	Positive effect
Storyline	√	Positive effect: consensus agreed that it is a good idea but needs improvement	√	Positive effect
Interactive simulation	√	Positive effect	√	Positive effect
Rules and Objectives	X		√	Positive effect
Challenges	√	Positive effect	√	Positive effect
Characters	√	Positive effect	√	Positive effect

Table (1): results summary of measuring the effect of utilizing gamification techniques in both experiments

Third aspect: Research abstract, conclusions and recommendations:

Abstract and conclusions:

The role of gamification in improving the learning process cannot be denied; as games include many elements which make them powerful tools for human learning, thus; utilizing gamification in higher education has the ability to help students improve their skills, keep them interested and participating in their courses and achieve their long-term objectives. Gamification also affects the method by which students remotely comprehend the theoretical subjects, it simulates them and increases their participation, thus; teachers as well will be affected by the mood promoted through the students' interaction with the curriculum, which creates an enjoyable educational environment full of challenges and does not feel mandatory to the students.

The remote education provides flexibility so that the student is capable of choosing the best location in which they can receive the information, therefore; designing an academic content based on motivation can enable the learners to discover, face challenges and get the sense of achievement and appreciation. The study findings show that gamification-based strategies resulted in a higher stimulation and participation of the learners; contrary to the online traditional curriculums as the integration between the students' participation and the resources provided by digital learning makes gamification a powerful tool to be used by the teachers.

Using gamification is not limited in motivating students in various ways only; but the effect of stimulation must be specified and the students' motives must be taken into consideration according to the context of the mission; through the integration of the utilized game elements, mechanics and dynamics, in addition to the effective use of a number of motivation measures; such as scoring and leader boards and badges; not only to motivate students to participate, but also to provide them with social appreciation for being ahead of their peers. Motivation measures identify the gamification effect on the students' stimulation and provide the required challenges which should not be too easy but should be designed in a way that makes learners attempt to think and apply. Meaning that although gamification is designed for learning coupled with enjoyment, but it must not be trivial because it is crucial to achieve the desired learning outcome, also; a successful gamification depends on the whole study curriculum and educational materials.

On the other hand; utilizing gamification in higher education leads to a behavioral change of the learner, it enhances maintaining knowledge, makes learning interesting, supports the sense of ownership and improves the skills of entrepreneurship; which can be achieved through group work and cultivating the spirit of collegiality from which students can benefit in the business world, as they cooperate with their colleagues to achieve common objectives; simply-designed common activities can be practically useful, promote intellectual challenge and social participation among the students.

Gamification is still a controversial issue due to its connection with games that are usually characterized of being addictive and a waste of time, therefore; any approach to introduce gamification elements in education might be resisted, especially if the element in question was not specifically and thoroughly explained; taking into consideration the educational requirements; through the teachers' capability to choose the appropriate gamification elements to achieve better outcomes, as well as the ability to apply these elements and connect them to the study content, because the application of all gamification elements at once can be

unsuccessful; teachers should also be able to respond to the students' individual needs as they arise and evaluate the gamification effect in actual time on regular basis, thus; ensure the flexibility of the study content.

Despite the positive findings of this study, still there aren't enough evidences to support the long-term benefits of applying gamification in the educational context, or identify whether the students' comprehension of the study content will be maintained throughout the study year; or evaporates as soon as the course ends.

Recommendations:

- The researcher recommends that the professors of the Faculties of Engineering and Applied Arts use gamification techniques in designing the study content of the theoretical specialization theoretical subjects; with the purpose of facilitating understanding and comprehension to the students, provide them with the motive and stimuli to study and learn.

- The researcher recommends that the university professors and teachers attempt to develop improved methods to adjust their educational strategies and to search for various techniques to introduce gamification to educational methods.

- The researcher recommends that the university professors and teachers who try to apply game elements on online training courses, to take into consideration the main objective of gamification application, which is to improve the students' motivation and to add value to the traditional teaching and learning processes; not just to play; she also recommends that teachers be able to select and choose the elements which are more connected with their students; and that they should be capable of continuously apply these elements, respond to individual needs and regularly evaluate the impact of gamification in real time.

- The researcher recommends that the university professors and teachers update their technical knowledge in regard to using computerized applications related with education and to learn the innovative techniques used in the education process.

- The researcher recommends that the researchers and persons who are interested in studying modern educational techniques conduct more research regarding the connection between the academic achievement and the application of game elements and analyze the effect of these elements on male students, because this study discussed this effect on female students only.

- Since this analyzed study did not include any tests conducted from the teachers' point of view; the researcher recommends that more effort be done to measure the impact of gamification on teaching based on the educational context from teachers' perspective and to study methods through which teachers can improve their programs, by transforming the study content into games.

- The researcher recommends encouraging the cooperation between public and private sectors to invest in designing university curriculum based on integrating gamification in the scientific content, because gamification provides great opportunities to improve technological skills for the future generations of students.

- The researcher recommends that societies all over the world try to balance between spending on education and other financial requirements, because mastering gamification techniques requires a lot of planning and restructuring of the teaching methods currently used by teachers; strategies would be successful only if totally integrated in the study content.

- The researcher recommends the educational enterprises to study the potentiality of applying remote virtual classes during the times of pandemics; to protect the students and their families.
- The researcher recommends higher education enterprises to study the potentiality of using gamification in their real or virtual classes; by integrating the following methods:
* Apply gamification on the scoring system; by adjusting the method of tasks evaluation and grades accumulation and substitute the scores with the more appealing "experience points – XPs", by which the students' grades are calculated from the number of points they achieved at the end of the study course; this way, students can advance in levels throughout the semester (similar to games).
* Establish a rewarding system based on experience points according to the semester activities, such as completing tasks in due time or participation in the class, while enabling the students to track their progress.
* Strengthen functions as when the teacher transforms a week or more of the course schedule into research through which the students have the chance to collect badges for both completion and perfection.
* Encourage group work.

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