Proposed Model for Designing Three-Dimensional Virtual Environment Based on Gamification Strategy to Develop Student Engagement

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ABSTRACT

Three-dimensional virtual learning environments are considered the most important technological innovations that have attracted the attention of educational institutions due to their ability to simulate reality and allow the learner to interact with them, and as a result, the learner emerges effectively into the learning process and in light of the search for the continuous development and improvement of these environments by employing the latest e-learning strategies, including the gamification strategy, which is a didactic approach that can motivate students to learn by using the elements of games in virtual learning environments to achieve maximum fun and participation in the learning process.

This paper aims to present a proposed model for designing 3D virtual learning environments in the light of employing a gamification strategy as a model that is guided by its stages and steps to develop student engagement at Mansoura University in Egypt.

The methodology used in the identification of successful strategies and practices is based on reviewing the literature about the concept of the 3D virtual learning environment, its importance, and when to use it in the educational process. In addition, it reviews the strategy of gamification, its components, and its designing steps frameworks. Examples and suggestions are included. As well as it reviews the concept of student engagement, its importance, and its relation with a 3D virtual learning environment.

The findings help stakeholders at higher education institutions to propose a framework. This framework integrates three-Dimensional Virtual Learning Environments based on gamification strategy to engage students in delivering engaging content.

KEYWORDS: Virtual Reality, Three-dimensional virtual learning environments, Gamification, Student engagement, Instructional design, Higher education.

Introduction

In light of the current revolution in information and communication technology, educational institutions, especially universities and higher education institutions, have had to work to provide interesting and attractive educational environments in line with the interests of various students, and among the most prominent of these efforts is the attempt to provide virtual learning environments that integrate students with learning environments and work to increase students' motivation and integrate them effectively in the learning process.

Cobb (2007) declared that Virtual Reality (VR) refers to a system that uses a set of computing technologies to create and allow learners to interact with three-dimensional (3D) virtual environments (VEs) or a three-dimensional (3D) simulated digital environment. The 3D virtual environment differs from 2D environment, where learners can navigate inside the environment to any direction rather than following a predetermined pass, and they may use a special display tool to become fully immersed inside the computerized environment (Khamis, 2003; Cobb, 2007, Ludlow, 2015), and it is a computer-generated screen that allows a learner (or learners) to feel as if they are in a different environment than the one in which they are present. (Warburton, 2009).

There are many advantages for using 3D virtual environments in education including increase interaction level with the instructional content, help users to view a given problem from different perspectives, facilitate instructional activities that are dangerous and difficult to be done safely in a real-life, access digital content simultaneously, share and participate information, receive instant multifaceted feedback, interact with objects and beers from any place and at any time. Provision of transportation costs and laboratory experiments. (Prasolova-Førland, 2008; Omale, et al. 2009; De Lucia, et al. 2009; El-Sabagh, 2011; Sullivan, et al. 2011; Cheng & Wang 2011).

Many studies have confirmed the effectiveness of employing the 3D digital environment in education, including A study by Bedeer (2014) that concluded the effectiveness of using virtual reality technology in developing

cognitive achievement, visual thinking, and attitudes towards science among middle school students. A study by Can & Simsek (2015) that confirmed the effectiveness of using a 3D virtual learning environment in training foreign language pre-service teachers at Istanbul University. A study by Bogusevschi, et. al, (2020) concluded that secondary school students in Dublin achieved a high score and enjoyed Learning Physics through 3D Virtual Learning Environment. A study by Hafez (2020) confirmed the effectiveness of a virtual three-dimensional laboratory based on the second life to develop the skills of using computer networks to (40) students at Nile Higher Institute for Commercial Sciences and Computer Technology, Mansoura: higher education institutes. According to Reisolu, et al., (2017), 3D virtual learning environments are primarily meant to facilitate learning, games, and simulations, based on a descriptive review of 167 experimental research that explored the use of 3D virtual worlds in education. The most researched subjects were science and language learning. In many 3D virtual learning environments, collaborative strategies and investigation-based learning have been used regularly. As emotional and cognitive achievements, satisfaction, engagement, and communication abilities were investigated.

Many universities around the world have used and constructed their own 3D virtual campus environments to improve their instructional environment and efficiently achieve their goals. (Prasolova-Førland, 2008; Cheryan, Meltzoff, & Kim, 2011). On the other hand, Scott, Soria, and Campo (2017) indicated that the 3D virtual learning environments need more researches towards their development and toward their enhancement to create enhanced learning experiences in different contexts and in this context this research attempt to introduce a conceptual framework that contributes in effective employment for gamification strategy in the 3D virtual learning environment which means the use of game-design techniques and game elements in a non-game context to increase user engagement and retention (De-Marcos, Domínguez, Saenz-de-Navarrete, and Pagés, 2017), and this due to the criteria and advantages of this strategy in the learning process where Kapp (2012) mentioned that the gamification means the usage of game-based techniques, aesthetics, and game thinking to users engagement, action motivation, learning to promote, and problems solving.

Deterding et al., (2011) claimed that the basic objective behind gamification in the learning process is to boost user engagement using game techniques like scoreboards and personalized instant feedback.

Consequently, the main objective of this research is to introduce a model including the conceptual framework for designing a 3D virtual learning environment based on a gamification strategy for student engagement among learners at Mansoura University. Bogusevschi, Muntean, and Muntean (2020) stated that 3D virtual learning environments are critical to improving students' motivation and engagement in the learning process, which supports the requirements to attain this goal. Furthermore, these kinds of environments that support simulations and observations for various experiments may be able to solve a frequent difficulty in many educational institutes, which is a shortage of equipment and resources in their labs due to a restricted budget and costly laboratory maintenance costs.

Theoretical Framework

Considering the increasing trend towards employing virtual learning environments inside educational institutions, and the search for the best ways to develop them to improve learning outcomes. As well as the importance of gamification strategy, and its role in enhancing the educational system. The theoretical framework of the research will address the following items.

THREE-DIMENSIONAL VIRTUAL LEARNING ENVIRONMENT

Virtual learning is a highly interactive multimedia environment that puts the learners inside a virtual world which allows them to create and conduct simulated experiments, and to visualize the effects of the experiment in a 3D environment. (Bogusevschi, Muntean, & Muntean, 2020)

This technology support students to enhance their problem solving, computer literacy, and practical skills, which are necessary skills for lifelong learning, enjoyably, as well as the use of 3D in VLE, has many benefits including the interaction between students and instructors through avatars, collaboration and participation among students, doing the experimental activities more quickly than in a real word experiment, the same experiment can be run multiple times at no extra cost for materials, encourages collaboration and communication between teachers and students, and easy observation of the experiment at a suitable time for the learner. (El-Sabagh, 2011; Dubas, Pressley, Tavakoli, & Miah, 2014; Bogusevschi, Muntean, & Muntean, 2020).

Many studies have concluded that 3D virtual learning environments have a positive impact on the development of learning outcomes, such as one by

Dubas, et al. (2014) which found that the three-dimensional 3D virtual world offers an opportunity to engage students in online courses at southeastern university allowing their avatars to meet face to face in a 3D virtual world to improve their learning and performance In comparison to traditional labs, virtual reality increased the level of knowledge among students (Brinson, 2015).

A study by Simsek (2016) concluded that virtual reality increased students' positive attitudes and interest in mathematics. A study by Rasim et al. (2017) found that Implementation of the 3D virtual learning environment can improve students' cognitive achievement in software engineering courses. A study by Bogusevschi, et al., (2020) showed that using a 3D virtual learning environment in teaching physics support students to gain a high experience score. also found the application enjoyable for students and they would like to take part in such novel-approach lessons more often. In the field of virtual learning environments design, it passes through defined steps including Understanding target groups, selecting design platform, locating learning materials by design purpose, and applying different learning strategies (Fjeld et al. 2002; Dickey 2003; Franceschi et al. 2009; Warburton 2009; El-Sabagh, 2011; Eisenbeiss et al. 2012; Karakus et al. 2016).

Many platforms, including Second Life, Traveler, Active Worlds, Adobe Atmosphere, On Live! Croquet, and Open-Sim, have been used to create 3D learning environments. These platforms were originally designed for games and entertainment, but are now being used for educational purposes (Hew & Cheung 2010; Duncan et al. 2012; Wang et al. 2012). As illustrated in Fig. 1, Pantelidis (2009) proposed a strategy for identifying when virtual reality should be used in online courses.

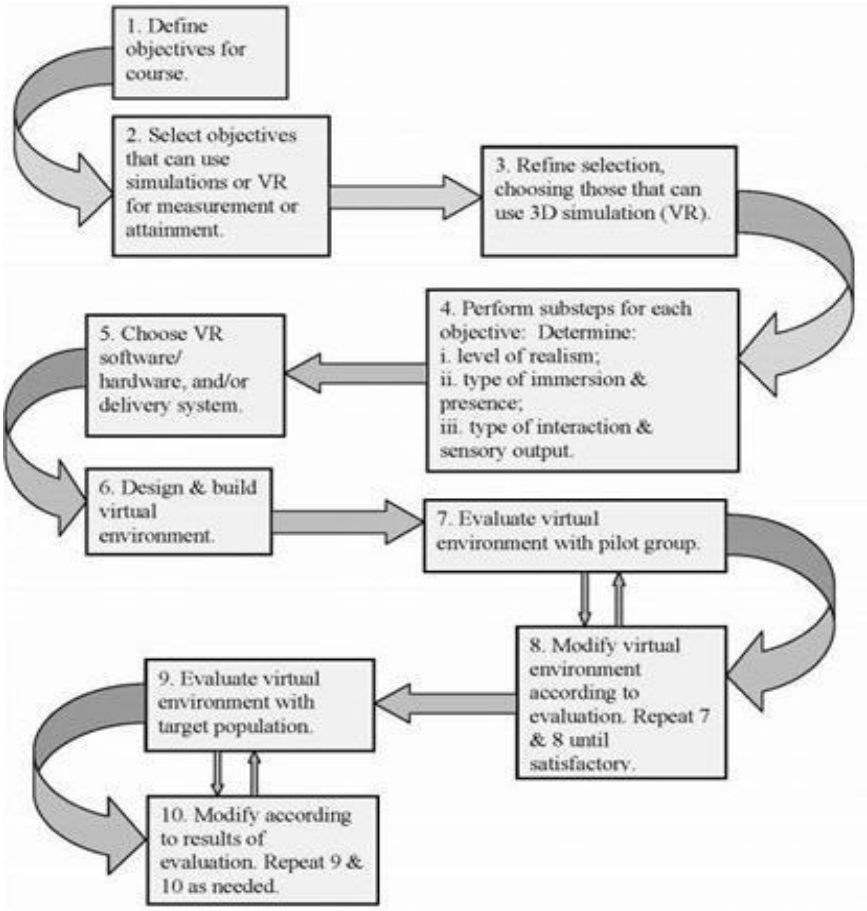

Figure 1. A model for determining when to use virtual reality in instructional courses Pantelidis (2009).

As shown in Fig 1. The model contains ten steps: Step 1. Defining objectives of a specific course. Step 2. Selecting the objectives that are suitable for using simulation. Step 3. Refining the selection list of objectives through choosing those that can use a 3D virtual reality. Step 4. For every objective in the list, the following sub-steps must be done: 1. Determining the level of realism required, on a scale from very symbolic to very real. 2. Determining the immersion type, for example, desktop VR to full immersion using a head-mounted display, gloves. 3. Determining the type of interaction with the virtual world, for example, haptic - tactile or feeling, 3D sound, audio, visual, text, gesture. Step 5: Selecting required tools, such as virtual reality software, hardware, and a distribution mechanism (platforms).

Step 6: The virtual environment (VE) is created and constructed by the objectives. Step 7: Evaluate with a small group of students. Step 8: Changes to the virtual environment based on the evaluation results. Step 9: Using the target population, assess the virtual environment. Step 10: The evaluation results are used to modify the virtual environment. The target population continues to use the virtual environment for evaluation and development.
In VRLE, three factors affect the quality of virtual reality design: virtualization (virtualization of scenes greatly affects the application effects of virtual reality technology), realistic (the degree of students' sense of the virtual reality environment such as vision, hearing, smell, touch, etc should be realistic), and interactivity (the strong interactivity with the environment makes corresponding responses) (Dong, Song, &Song, 2019).

Gamification Strategy

The motivation and engagement of e-learning users are considered an important aim for many researchers to enhance learning outcomes (Wongso, Rosmanyah & Bandung, 2014). Muntean (2011) mentioned that gamification is considered an attractive and engaging tool to motivate students, especially when tasks are boring, and activities are tedious where. Deterding, et. al, (2011) stated that gamification is the use of game design techniques in a non-game context.
Many studies have confirmed the effectiveness of gamification in education, including one by Hew, Huang, Chu, and Chiu (2016), which determined the impact of game mechanics on student cognitive and behavioral engagements. De-Marcos, Domnguez, et al. (2017) conducted a study that found that gamification provided better performance compared with other traditional e-learning approaches in the academic achievement.
Yildirim (2017) confirmed the gamification effectiveness on student achievement and students' attitudes toward lessons. Al- Batneen (2020) concluded the effect of using the gamification strategy through tablets on Acquiring mathematical operations skills for students, and Al- Nadi (2020) concluded the effect of using gamification on the improvement of creative thinking skills among students in the science subject. According to Hunick, Leblance, and Zubek(2004). Gamification includes three components:

- Mechanics: The elements that help the user to interact with the game. Bunchball (2012) has identified the most popular mechanisms for interaction including as points which are used to reward the user, and an indicator for the progress, Levels which is used as indicators

for achieving a certain level, and push users to upgrade automatically, Challenges give users the feeling that they are working for achieving a specific goal, Honor lists use the competition to express desired practices to induce a certain behavior, Virtual Goods Make the game more effective by exchanging points and their exchange, and Feedback which is necessary to engage users with the game

- Dynamics: It searches to accommodate users' needs and their desires, such as the desire for self-expression, reward, and competition. Bunchball (2012) summarized the human desires in the reward which occurs through gaining points, promoting, or buying goods, achievement comes through the challenge to doing, and ending difficult tasks, self-expression means the desire to express independence and altruism which made through supporting the others and giving gifts to them.
- Aesthetics: Describing the desirable emotions revealed through interacting with the game system. Fun, credibility, and surprise, game's appearance, color, diversity, and originality in the game's design and presentation.

Thanekar (2015) mentioned that gamification is distinguished from the concept of the game, and game-based learning, where the main purpose for gamification is to motivate users to take some action and do something; also losing may or may not be possible. Werbach and Hunter (2012) classify the users in gamification according to four types: Explorers, where an experience is the main objective for them. Achievers like to achieve things in a competitive environment. Socializers search for social interaction. Killers are the same as achievers, but they must win and someone else must lose (their winning is not enough).

In addition, Reeves and Read (2009) introduced the gamification attributes to make a successful learning design for gamification including self-representations, three-dimensional environments, narrative, feedback, reputations ranks and levels, marketplaces, and competition correlated to the rules, teams, communication, and time pressure.

In terms of gamification instructional design. As shown in fig. 2, a designed model for introducing gamification in e-learning can be considered a project that can be related to a software designing process. As a result, the gamification designing process should follow all stages of e-learning system

development: analysis, design, development, implementation, and evaluation. (Wongso, et al., 2014; Urh, et al., 2015).

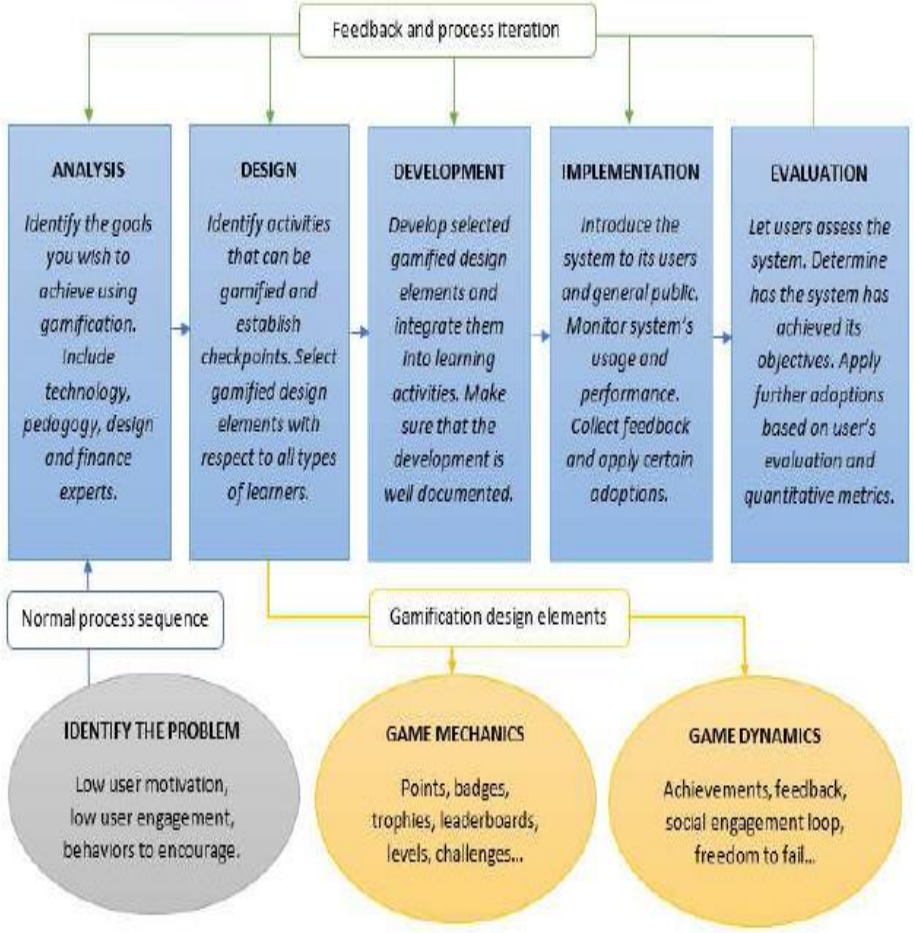

Figure 2. Phases of introducing Gamification into e-learning system. (Wongso, et al., 2014; Urh, et al., 2015).

Student Engagement

Student engagement is important to student learning, particularly in the virtual environment, where students often feel isolated and inaccessible (Dixson, 2015). Student engagement in web-based learning systems, as well as traditional educational systems, has been the subject of extensive

research. Guo et al. (2014), for example, looked at how engaged students were when watching movies. The time spent watching the movie and the number of times the student replied to assessments were used to determine the study's input characteristics. Movies were found to interest students more than prerecorded lectures, according to the study.

Individual attitudes, thoughts, and behaviors, as well as communication with others, create engagement. Student engagement refers to students devoting time, energy, thought, effort, and, to a degree, feelings to their studying. As a result, learner engagement attempts to assess what students do (actively and in their thought processes) Indeed, studies comparing face-to-face and online classes have shown that online courses can be just as effective as traditional face-to-face classes (Maki & Maki, 2007). Student engagement refers to how actively students engage with a course's content, other students in the class, and the instructor by thinking, talking, and interacting with it. Student engagement is critical for keeping students engaged in the course and, as a result, in their learning (Robinson & Hullinger, 2008).

Learning effort, participation in activities, interaction, learning satisfaction, and learning desire, according to reviews of prior literature on student engagement, are essential indications of student involvement in face-to-face learning environments (Lee, et al., 2019).

Several key features of virtual environments can be used as measures of student engagement. Successful and engaged online learners learn actively, have the psychological motivation to learn, make good use of existing knowledge, keep track of their learning schedule, and make appropriate use of online technology (Dixon, 2015).

In terms of 3D VLEs, the exploration of the concept of avatars enables greater opportunities for student engagement than other technologies: the narrative is an imaginative and creative process; avatars are animated agents that represent individual participants and connect sociability and interactivity. (Wan, Reddy, & Longman, 2011). Min, Vos, Kommers, and Dijkum(2000) mentioned the mechanism of the learning process through simulated Models or objects as shown in figure 3.

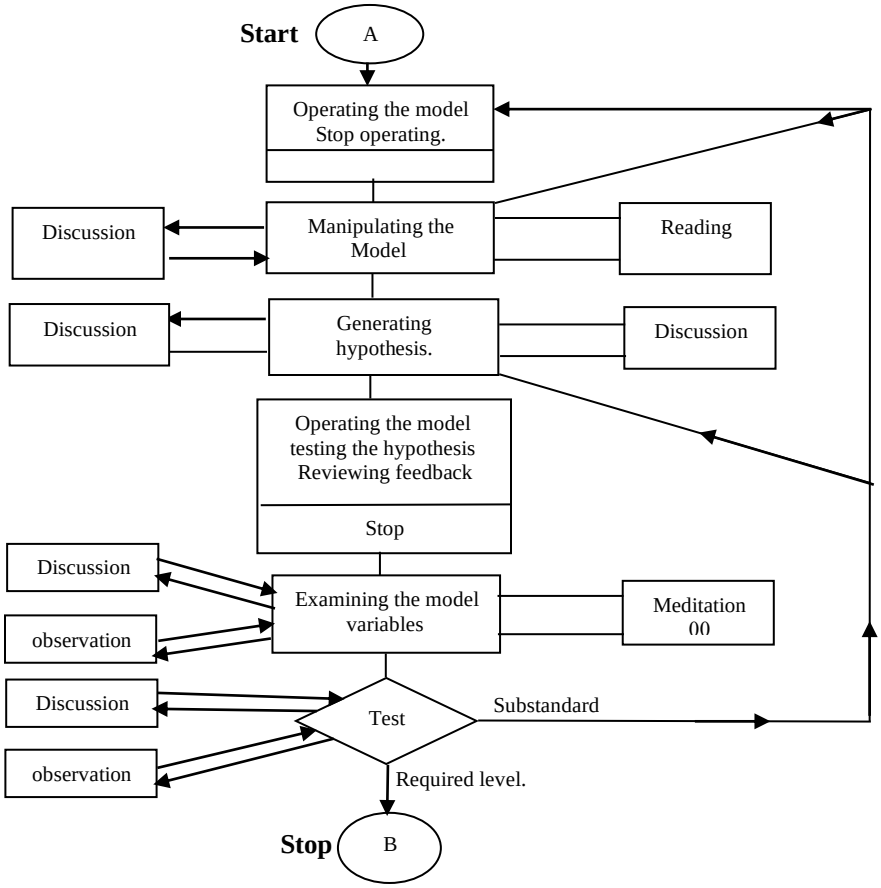

Figure 3. Learning process through simulated Models (Min, Vos, Kommers, & Dijkum, 2000).

As shown in figure 3. The Simulated Environment depends on an active learner who is responsible for his learning, where he deals with the objects in the environment and discovers their criteria by mediation, observation, reading, discussion with his peers, and reviewing feedback for his action. All these variables are the main factors to enhance effective student engagement in the learning process.

The learner changes his behavior - during the learning process – in a 3D virtual learning environment according to the environment with which he

interacts, as the information coming from the environment determines the type of response that can be to meet specific needs or avoid an unwanted situation. These learning theories focus on the implementation of the intellectual activity of the learner in the learning process, these processes lead to the occurrence of learning. (Hamdan, 2017).

Learning theories are of great importance to knowledge resources and learning strategies, especially the three-dimensional virtual environment in terms of (attention, understanding, memory, reception, information processing, and processing).

The constructivist theory plays an important role in enhancing learning through technology by building the learner with knowledge within his mind and interpreting what the learner receives so that he builds meanings based on his knowledge. Learning concepts are also based on deductive conclusions as the student learns within the framework of constructivism theory through errors and learning. Active as a condition for learning so that knowledge considered valid is constructed across the experience. (Ahmad, et al., 2019).

In recent times, interest in modern technologies, including augmented reality technology, has increased due to the benefits it can achieve within the learning environment, including raising the level of learners 'satisfaction and their experiences in multimedia learner environments and increasing students' motivation to learn (Freeman et al, 2014). By applying emerging technologies such as 3-D virtual reality in teaching and educational activities (Eisa & El-Sabagh, 2018), in addition to developing educational satisfaction among students and enabling them to build their knowledge and complete their educational tasks (Lee, 2010) and helping to develop the skills and knowledge of learners in a way. More interactive (McIntyre, et al., 2018).

Methodology

The authors reviewed studies and literature that dealt with the 3D learning environment in terms of concept, classifications, and frameworks for designing and development. As well as studies and literature, that dealt with gamification in terms of concept, components, features, and implementation mechanisms. In addition, by reviewing several of the instructional designing models in the field of e-learning, the research method is conducted as follows for introducing a proposed model of designing a 3D virtual environment based on gamification.

The instructional design can be defined as a process of objectives and learning needs analysis, and the development of educational materials to fulfill those needs, with the development of evaluation activities for the various activities of the learner (Kurt, 2017).
Berger and Kam (1996) mentioned that the importance of instructional design models comes in providing flexible, interactive instructions that lead to the adequacy and quality of the education process. Although many instructional design models have been developed to suit various educational purposes, they share five basic stages as shown in fig. 4 (McGriff, 2000).

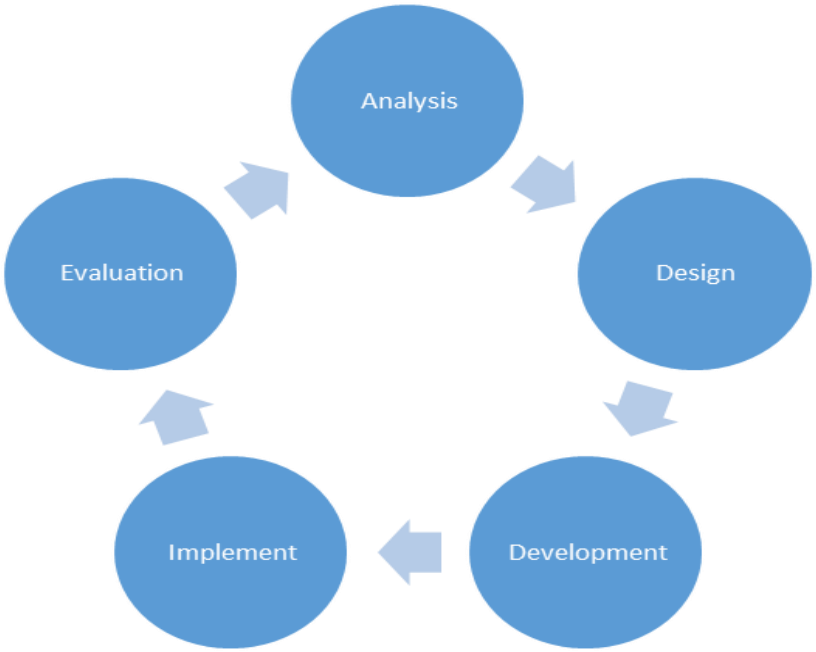

Figure 4. ADDIE Model (McGriff, 2000).

Analysis stage concern with identifying the problem, defining instructional environment elements, and proposing solutions. The design means the determination of what learners must accomplish, and concern with the proposed structure for the instructional learning environment. Development refers to the production of learning materials. Implementation means the learner's interaction with the learning materials to achieve learning goals and acquire the required knowledge and skills. Evaluation refers to the

processes of measuring the effectiveness and sufficiency of the education process and judging its quality.

In the light of the above, and by reviewing what mentioned around the instructional designing models for 3D virtual learning environment (Chen, Toh, & Wan, 2004; Dong, Song, &Song, 2019; Fragkaki et al, 2020; Joe,2020), and the designing models for gamification (Di Tomasso, 2011; Werbach and Hunter, 2012; Marache-Francisco and Brangier (2013), as well as various instructional design models, especially for e-learning (Montiva, Sandia, Barrios, 2002; Comb, 2003; Gawdat, 2003; Nam and Smith, 2007; Elsigini,2012).

The authors propose an instructional designing model for a 3D virtual learning environment based on gamification in figure 5.

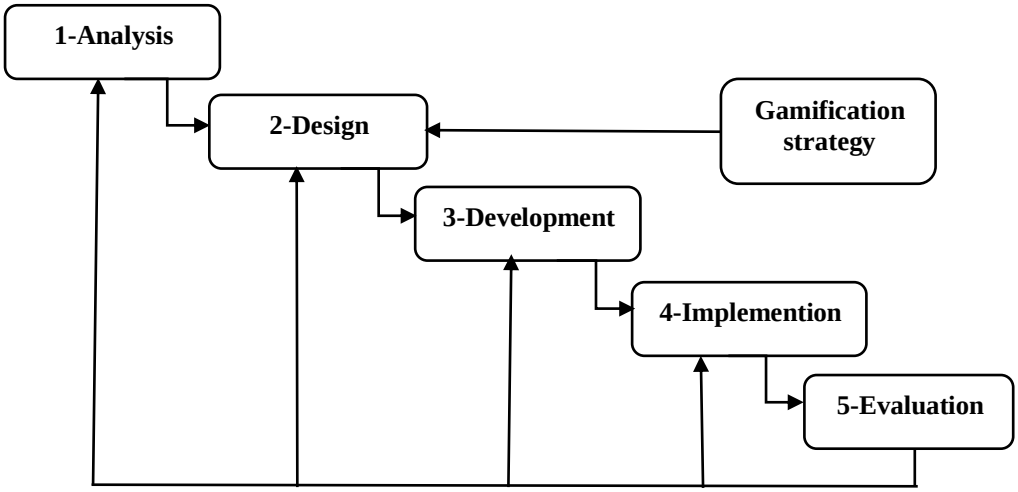

Figure 5. A proposed designing model for a 3D virtual learning environment based on gamification.

The following is an explanation of the components of the previous model in Fig. 5

1. **Analysis**

It is the starting point in the instructional design process, and it must be completed before starting the virtual environment development processes, :and it includes the following stages

1.1. Needs assessment.

This step includes identifying a specific problem, the problem may be that students need a program that helps them understand a specific content or help them to integrate effectively in the study of content and encourage them to learn and acquire desirable behaviors, which it is believed that students' dealing with a virtual three-dimensional environment will avoid and overcome this problem. This step is based on polling students' or teachers 'opinions about specific topics, as well as students' opinions about their special needs in these topics, and this step should be done with the support of previous studies and theoretical frameworks that dealt with this problem.

1.2. Determining the general objectives.

It means the goals that the environment aims to achieve, and are characterized by general and comprehensiveness, and they are not required to be measurable.

1.3. Analyzing the characteristics of the learners.

Knowing the characteristics of students who will deal with the environment and their academic and psychological abilities.

1.4. Analyzing resources and constraints in the environment.

This step includes identifying the work team responsible for developing the educational environment, and the required equipment in terms of hardware and software. As well as determining the stages and procedures of the development activities and the necessary timetable for their implementation. In addition, determining the development budget and its sources. It also defines the methods and mechanisms of review that take place at the end of each stage of development to ensure that the system meets the quality standards of virtual learning environments.

2. Design

The design process aims to set conditions and specifications for learning resources and processes and includes the design of the following elements.

2.1. Setting behavioral goals

Formulation and translation of the general objective into several measurable objectives.

2.2. Refinement of behavioral goals:

Determine the objectives whose presentation is compatible with the nature of the 3D virtual environment. With the identification of each goal, the characteristics of the 3D simulated model is determined in terms of:

- Degree of realism (abstract - real)
- Degree of immersion (desktop- full immersion)
- Nature of interaction (hepatic, tactile, 3d sound, audio, visual)

2.3. Designing the measurement tools.

They are the tools and tests that focus on measuring goals and are directly related to the performance criteria specified in the goals and their types are:

- The pre-test, which is given to learners before studying the program, and measures the goals of new learning.
- Post-test, which also measures the goals of the new learning, and is given to learners after studying the program. It may be an equivalent formula for the pre-test or itself.
- The implicit tests, which are a group of questions spread throughout the program, and are useful in the formative evaluation of learning, and in guiding the learner.

2.4. Defining, selecting, and organizing the content.

The content elements are identified and placed in an appropriate sequence to achieve the educational goals, and it is preferable to collect content elements from more than one reference.

2.5. Designing gamification activities:

They take place through the following steps:

2.5.1. Determining the goals behind the application of the gamification activity (integrating the learners into the educational environment - encouraging them to learn - acquiring new behaviors) with determining how to measure these behaviors, including points and winning cases, with the need to develop methods of analysis such as the rate of use and the number of participants.

2.5.2. Description of the players: where the players are identified and their needs are described. The players have a set of characteristics and classifications, which are as follows:

- Achiever: It is the player mode that prefers to earn points. They will take the longest possible time to earn the reward, and their best practice in gambling is a visual list of their accomplishments.
- Killer: It is a type of player whose most concern is defeating others overwhelmingly, and one of the best rewards is placing them on the honor roll.
- The Explorer: He is not primarily interested in earning points but is interested primarily in knowing what is possible within the game.

- Social: His first concern is the participation of others in the game, and thus the social experience has better than the game's goals.

2.5.3. Split activity rings: The activity is divided into stages or interrelated levels, with the need to consider and determine the following:

- The mechanism to track and measure the student's progress in learning.
- The unit to measure the progress of learning. The unit may be points, time, or otherwise.
- The level of learning progress, which is related to the unit of measurement for the student to move to the next level.
- Rules and instructions that control the behavior of the learner at the level, to ensure a fair learning environment for all students.
- Feedback to the learner, as the student achieves better learning when he knows his faults and weaknesses.
- Providing opportunities for competition, cooperation, and self-expression to obtain the greatest amount of fun.
- Providing rewards by earning points, promoting to a higher level, or placing names on the honor board.

2.5.4. Intimate the activity:

One of the things that must be considered when designing the end of an activity is the balance between the purpose of the activity and the desired output.

2.6. Creating the flow chart:

It consists of sequential and interrelated steps in the form of symbols, layout, geometric shapes, and arrows, and its final shape gives an accurate description of the arrangement of the program screens, and what they represent, and their function.

2.7. Screens' design.

The stage in which the outlines identified in the previous steps are translated into detailed procedures on paper, and the work at this stage is summarized by recording what should be displayed on the screen and the user interaction with it.

3. Development

It is the translation of what has been formulated on paper into a tangible physical reality that learners can use and deal with, where gamification elements and media elements of the virtual educational environment are produced and presented through platform Active Worlds, Second Life,

Open-Sim, Croquet, and Adobe Atmosphere are examples of virtual worlds that can be improved and developed.

Usually, the second life environment is combined with the "Moodle" learning management system to have a "Sloodle" system, which combines the characteristics of the Moodle learning management system with the characteristics of the second life. The idea is that some Moodle services, such as advertisements, calendar, tables, etc., are linked to three-dimensional objects in the second life environment, and when the content of these services change in the model program, the change appears in the objects in the second life environment, considering the following steps:

- Presenting the initial Prototype to a group of experts in the field of e-learning to judge the quality of the system and its fulfillment of the quality criteria for designing virtual learning environments.
- Presenting the prototype to an exploratory sample of the target group to recognize their opinions and attitudes towards the system.
- Amending the initial form considering the opinions of the arbitrators and the opinions of the exploratory sample.

4. Implementation

It is the stage of introducing the system to the users while receiving feedback. This stage also requires continuous follow-up to the use of the system where the optimum performance of the system must be achieved. This stage indicates the end of the development process and the start of the operation process.

A pre-test may be presented and given to learners before studying the program that was prepared at the design stage.

5. Evaluation

It is the stage of judging the effectiveness of the system in achieving its goals, where users will evaluate the implemented system through opinion polls, and Many quantitative measures can be used to analyze learner engagement, including visitor screen views, time spent by each user, frequency of visits, participation, and conversations. The insights gained during the evaluation step can be applied to the system's future development.

The post-test is also applied and a comparison between the pre and post-application of the achievement test using statistical methods can be done to know the impact factor for the system.

Finding & Disucussion

The current research has reached a comprehensive five-stage model for designing three-dimensional learning environments in the light of employing the gamification strategy as one of the most important e-learning strategies to support students' engagement in the learning process with fun and enjoyment**.**

The stages of the proposed model are consistent with the general model of educational design (McGriff, 2000)., as it consists of five stages: analysis, design, development, implementation, and evaluation, but the steps in each stage are commensurate with the nature of the goal of the model, which is the design of a three-dimensional learning environment based on the gamification strategy for student engagement. This can be explained as follows**:**

In the analysis stage, the model provided a comprehensive view of the learning environment analysis in terms of defining the problem, the general objective, the characteristics of the learners, and the recourses and limitations of the environment. Also setting a timeframe for the implementation of the development process and review mechanisms, and is consistent with what was mentioned by Montiva, et al., (2002), Comb (2003), Elsigini (2012), Don, et al. (2019).

In the Design stage, the model creates specific consecutive steps to prepare a clear and final vision of the shape of the three-dimensional environment based on the gamification strategy, in light of several variables, such as determining what is the appropriate part of the content that is presented through the three-dimensional environment, and what are the characteristics of the simulated model that effectively achieves the objectives of this part of the content, i.e a complex interaction of three main types of knowledge: Content Knowledge (CK), Pedagogy Knowledge (PK), and Technology Knowledge (TK). This is consistent with what is emphasized by Pantelidis (2009), Fragkaki et al (2020).

Specific steps have been set to implement the gamification strategy in terms of determining the goal of the activity - determining the characteristics of the players - determining the paths of activity and the rules and rewards of progress, and determining the end of the activity, and this is consistent with what by Di Tomasso (2011), Werbach and Hunter (2012).

The design stage ends when a final form is placed on paper about the system's shape showing the sequence of screens and the media they contain and the learner's interaction mechanisms with these screens., and this is

consistent with what mentioned by Gawdat(2003), Dong, Song, &Song (2019).

The model is peculiar in the development stage where usually the second life environment is combined with the "Moodle" learning management system to have a "SLOODLE" system, which combines the characteristics of the Moodle learning management system with the characteristics of the second life. and this is consistent with what was mentioned by Al-Yajzi (2015), Hartley, et al., (2015)

After that, the model contains the implement stage was introducing the system to the users while receiving the feedback. The evaluation stage refers to the stage of judging the effectiveness of the system in achieving through opinion polls, and many quantitative indicators can be used to analyze user engagement, including visitor screen views, total time spent by each learner, visit frequency, participation, and dialogues. The conclusions drawn from the evaluation stage can be used for further development of the system. Also, there is an interim evaluation to judge the quality of each stage of the model before moving to the next stage, this is consistent with what mentioned by Montiva, et al., (2002), Comb (2003); Gawdat (2003), Nam & Smith (2007); and Elsigini (2012).

Conclusion & Recommendations

The use of a 3D virtual learning environment to support the learning processes is one of the most important modern trends that attracted the attention of educational experts and instructional designers and, in this regard, a model has been proposed for employing gamification strategy in the 3D virtual learning environment at Mansoura University, by taking advantages and the characteristics of designing models for 3D virtual learning environments, models for designing gamification, and models for designing various e-learning programs. It includes five stages: analysis, design, development, implementation, and evaluation.

Through the above, a set of proposals and recommendations can be presented as follows: Apply the proposed model of employing gamification strategy into a 3D virtual learning environment to develop academic achievement in higher education institutions. Spreading awareness among instructional institutes about the importance of employing a 3D virtual learning environment in the learning process. Providing the fund and human resources to develop a 3D virtual learning environment at Egyptian universities. Drawing the attention of decision-makers and stakeholders at

higher education institutions to enhance the learning environment through innovative technology and e-learning strategies. The latest teaching strategies and methods based on modern technologies will be researched to develop the teaching and learning community at higher education institutes. The research on the quality standards that should characterize 3D virtual learning environments at Egyptian universities. Holding specialized scientific conferences periodically; to find out what is new in the field of designing the 3D virtual learning environment, and modern technologies to enhance learning processes. Encouraging innovation among Egyptian universities in creating 3D virtual learning environments, and how to ensure their effectiveness.

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العنوان: نموذج مقترح لتصميم بيئة تعلم افتراضية ثلاثية الأبعاد قائمة على استراتيجية التلعيب لتطوير مشاركة الطلاب

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الملخص بالعربية

تعتبر بيئات التعلم الافتراضية ثلاثية الأبعاد من أهم المستحدثات التكنولوجية التي جذبت انتباه المؤسسات التعليمية نظرًا لقدرتها على محاكاة الواقع والسماح للمتعلم بالتفاعل معها، ونتيجة لذلك يتم دمج المتعلم بفاعلية في عملية التعلم. وفي ضوء البحث عن التطوير والتحسين المستمر لهذه البيئات من خلال توظيف أحدث استراتيجيات التعلم الإلكتروني، بما في ذلك استراتيجية التلعيب التي تمثل نهج تعليمي يمكن أن يحفز الطلاب على التعلم باستخدام عناصر الألعاب في بيئات التعلم الافتراضية لتحقيق أقصى قدر من المتعة والمشاركة في عملية التعلم.

يهدف هذا البحث إلى تقديم نموذج مقترح لتصميم بيئات تعلم افتراضية ثلاثية الأبعاد في ضوء توظيف استراتيجية التلعيب كنموذج يسترشد بمراحله وخطواته؛ لتطوير مشاركة الطلاب في بيئات التعلم الرقمية بجامعة المنصورة. استخدم الباحثان المنهج الوصفي التحليلي المعتمد على أسلوب الاستقصاء والتحليل لتحديد التصميم التعليمي والاستراتيجيات والممارسات الناجحة بناءً على مراجعة الأدبيات السابقة حول مفهوم وأهمية بيئة التعلم الافتراضية ثلاثية الأبعاد وكيفية استخدامها في العملية التعليمية. بالإضافة إلى ذلك، تحليل استراتيجية التلعيب ومكوناتها وأطر وخطوات التصميم الخاصة بها وتضمين الأمثلة والمقترحات. كما يتم استعراض مفهوم مشاركة الطلاب وأهميته علاقته ببيئة التعلم الافتراضية ثلاثية الأبعاد.

من المتوقع أن تسهم نتائج البحث في مساعدة متخذي القرار في مؤسسات التعليم العالي وبخاصة الجامعات على اقتراح إطار عمل "نموذج" يتم من خلاله تصميم بيئات التعلم الافتراضية ثلاثية الأبعاد في ضوء استراتيجية التلعيب لزيادة المشاركة الفعالة للطلاب بعملية التعلم مما يساهم في تحسين جودة مخرجات التعلم.

الكلمات المفتاحية: الواقع الافتراضي، بيئات التعلم ثلاثية الابعاد، التلعيب، مشاركة الطلاب، التصميم التعليمي، التعليم العالي.