A Proposed Model for Using the Gamification Approach to Develop Some Continuous Assessment Tools in the Sultanate of Oman: The Application of (Dr.Science) as a Model

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Abstract

The current study seeks to present a proposed model for developing and supporting some assessment tools for the basic education fourth grade in the Sultanate of Oman, consisting of the homework tool and the practical activities tool contained in the Omani assessment document for the fourth grade. The researchers used the conceptual framework approach, which is one of the methods used in the descriptive approach, and is deemed to be the most appropriate method for building and organizing theoretical models and frameworks, and for analyzing and describing theories (Abu Seif, 2017). The study material consisted of (Dr. Science), a mobile application designed by the researchers based on the gamification approach. The study recommended using elements of the gamification approach to support and develop some continuous assessment tools such as homework and practical activities.

Keywords: Gamification approach, assessment tools, theoretical models, Application.

Introduction:

The current century is witnessing many challenges and difficulties in the education field . The need to adopt new educational strategies has emerged, coinciding with the revolutionary development of information and communication, and the tremendous knowledge progress. Thus it was necessary to grant the greatest degree of interest to the independent access to information (Freitas et al., 2017). The development of communication

and information technology has led to the emergence of new forms of education systems, including: mobile education systems, which is considered a new form of e-learning (Raleiras et al., 2020). Mobile education means: "the process of using mobile phones or similar mobile devices , in teaching and learning processes (Alsaadat, 2016, p. 2833). The gamification approach is a recent trend that depends on the use of modern technologies to activate digital education and mobile education in the educational process.

Despite the novelty of the gamification approach in the education field, many researches and studies have tried to shed light on the results of integrating the gamification approach elements into teaching and learning processes (Alsawaier, 2018; Dicheva et al., 2015; Hamari et al., 2014; Sailer & Homner, 2019; Seaborn & Fels, 2015). The gamification approach is based on the use of gaming design techniques and gameplay elements to achieve non-gaming goals (Alsawaier, 2018; Arnold, 2014; Erenli, 2013). Gamification is generally defined as "the application of electronic game elements in order to achieve a specific goal, solve a specific problem, increase motivation towards achievement, or improve the level in other non-entertainment fields such as: media, marketing, health and education." (Kapp, 2012, p.10)

This study aims to present a proposed model for using the gamification approach as a tool for developing some elements of continuous assessment in the Sultanate of Oman, such as homework and practical activities. The researchers believe that the Coronavirus pandemic (COVID-19) has triggered the need to use modern techniques in assessing students in an accurate and non-random manner. (Christian et al., 2020). The recommendations of the current study may contribute to providing some ideas about the development of current assessment tools to be in line with nowadays requirements .

Theoretical Framework and Previous Studies:

First: The Gamification Approach

The use of gamification has been widespread in various fields sunch as the economic, sports and health aspects of the life. The user of gamification involves into a kind of game in order to obtain an athletic and healthy body or to increase income or obtain a job (Al-Qayed,

2015; Huotari & Hamari, 2012; Sailer & Homner, 2019). Therefore, the researchers believe that many international companies have tended to use gamification to promote their products or to increase profits. As for education, the use of gamification has increased in many fields and for different purposes, based on the results of positive studies related to gamification, which have proven to be effective in many areas such as boosting the learning achievement (Ibanez et al., 2014), acquiring scientific concepts (Hefnawi, 2017; Al-Hosani & Al-Balushi, 2022; Al-Qazzaz, 2018), increasing the motivation for achievement (Alsawaier, 2017; Barata et al., 2013; Dicheva et al., 2015) and the development of creativity and creative thinking (Al-Jarawi, 2019), which is encouraged by the fact that students of the current generation, who are more experienced and knowledgeable about electronic games and mobile technologies, as they were classified by (Prensky, 2001) as (digital natives), being the generation born after the 1980,s, as the technology had been a part and parcel of their lives. The Digital Natives are native speakers of the of digital language for computers and video games (Sanmugam, 2017, Alsawaier, 2018).

Gamification derives its components from the Self-Determination Theory [SDT] developed by Deci & Ryan, 2002 (Lamprinou & Paraskeva, 2015; Landers, 2015; Qarni & Abu Seif, 2016), This theory focuses on human motivations and the reasons for their choice of a particular activity without any external interference (Ackerman, 2018).This theory is based on three main human needs: a sense of connection, freedom of choice and competence. The sense of connection depicts the individual's need to feel that what he does is important and beingappreciated by the people around him, which is evident through the desire to form relationships and social interaction. The freedom of choice or independence, is based on the idea that the person is responsible for making personal decisions and avoid dependence on others. As for the third need, which is the competence, it is represented in the need to exercise the individual's sense of ability to achieve (Lamprinou & Paraskeva, 2015; Landers, 2015; Qarni & Abu Saif, 2016), On the scale of education, this theory considers that all students possess complete growth tendencies such as curiosity, self-motivation, and psychological needs, as well as the ability to absorb new knowledge and practices through the social context and socialization (Abdulaziz & Al-Atoum 2017).

The literature indicates that there is no universal approved approach on how to design gamification in different activities (Bakhanova et al., 2020; Morschheuser et al., 2014) and therefore many models appeared on the mechanisms of gamification design, including the (MDA) model proposed by Hunicke et al., (2004) and mentioned in the study of Al-Zein (2019), which referred to 3 elements for gamification, namely: mechanical elements, dynamic elements, and aesthetics of the games. The current study relied on this model in classifying the components of each element of gamification, which ares mentioned in a number of literature (Aldemir et al., 2018; Al-Qazzaz, 2018; Al-Zein, 2019).

- **Mechanical elements**: These are the functional components of a gamification-based application, settings, and interaction modes such as challenges, virtual goods, points, leaderboards, and levels.

- **Dynamic elements**: They are the behaviors and practices of the player when applying the interaction mechanisms that were designed by gamification designers. The dynamic elements reflect human desires such as the desire for self-expression, the desire to obtain reward, the desire to challenge and compete and the desire to obtain status and self-expression.

- **Aesthetics of the play**: It consists in the elements of attraction that appear on the game to attract attention, such as colors, diversity and joy, which are reflected in the player's behavior, making him feel happy and excited.

Many studies have indicated that gamification is very effective in increasing levels of fun and enjoyment, and it also helps in overcoming challenges, by raising levels of achievement and a sense of exploration and through rewards provided due to progress (Alsawaier, 2018; Bakhanova, 2020), especially for those who represent vulnerable groups, and those with less decision-making ability, who are reluctant to share their opinions, so gamification elements such as badges, points, and honor board can contribute to encouraging participation. This is emphasized further when students use technology, as they do not feel that they are using an educational tool, but they are just practicing their normal lifestyle (Hwang et al., 2013; Oak & Bae, 2013).

Second: Continuous Assessment in the Sultanate of Oman:

Evaluation is an effective element through which the effectiveness of the educational process and its ability to achieve goals and outputs is controlled. It also improves and develops the elements of the educational process given the strengths and weaknesses it provides about these elements (Al-Azizi, 2018; Ministry of Education, 2021). Despite the multiplicity of patterns of educational assessment, continuous assessment is considered as one of the most prominent of these patterns. Teaching and learning, which aims to diagnose the strengths and weaknesses of the learners' performance, improve their performance, activate the principle of "the learner is the center of the educational process" and focus on the learning process through the integration of skills, knowledge and information and their various applications, develop the learner's higher mental abilities, provide him with knowledge and skills, and identify the difficulties faced by each of thems. during the learning process, and taking the necessary treatment methods. This type of assessment also contributes to revealing the strengths and weaknesses of the educational program" (Ministry of Education, 2021, p. 21). Continuous assessment consists of two types of assessment: The formative continuous assessment and the final continuous assessment (Ministry of Education, 2021).

Formative Assessment is defined as: "An organized assessment process that occurs during teaching and itaims to provide the teacher and the learner with feedback to improve the teaching and learning processes, knowing the extent of the student's growth and direction, diagnosing the student's weaknesses and developing a plan to address them" (Al-Qamish et al., 2000, p. 25). Al-Azizi's study (2018) indicated the effectiveness of formative assessment in raising the level of achievement in science, monitoring, improving, directing and developing the educational process (Al-Azizi, 2018). The Sultanate of Oman adopted the idea of formative assessment based on the premise that learning should be designed to ensure understanding, and through the results of formative assessment many decisions can be adopted that can be used to move to the next step of learning. (Ambusaidi & Al-Rashidi, 2009), The study conducted by Ambusaidy & Al-Rashdi (2009) indicated that there are a number of difficulties faced by the Omani science teachers in applying formative assessment tools, including the large number of work, and the pressure and the intensity of the classes.

As for the summative assessment, it is defined as: " the assessment that aims to measure students' learning, i.e. issuing a judgment on the success of the learner in meeting the assessment criteria, to measure the learning objectives (outcomes) at the end of teaching a specific unit or group of lessons, or specific learning outcomes during the semester, or at the end of the semester, and is used to give the final score for measuring performance, or to provide data for decision-making to move the learner to a new level or the next stage of education" (Ministry of Education, 2021, p. 6), and tools have been designed final continuous assessment (for which grades are assigned) to be implemented after one part of the course or immediately upon completion of learning a set of objectives. It is performed at any time and in any content of the curriculum, bearing in mind that the final assessment of students takes place after obtaining sufficient opportunities to receive the necessary information. The continuous assessment document prepared by the Omani Ministry of Education for grades (5-9) refers to the elements of continuous assessment adopted in the Sultanate of Oman for teaching science, which are: homework, oral dialogue, practical activities, short tests, and the final exam. (Omani Ministry of Education, 2019). Figure (1) shows the final continuous assessment tools found in the student learning assessment document related to science for grades (5-9) (Ministry of Education, 2021). Figure (2) shows the relative distribution of these tools in the assessment document.

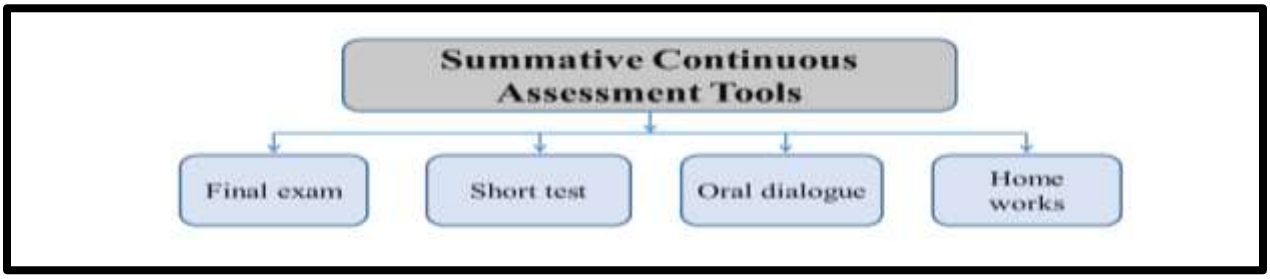

Figure (1): Summative Continous Assessment Tools in Oman

Notes	Marks	Continuous evaluation tools
Two short tests, of 15 marks each	30	Short tests
It evaluates twice, each time 5 marks	10	Homeworks
It evaluates twice, each time 5 marks	10	Oral Dialogue
It evaluates twice, each time 5 marks	10	Practical activities
Prepared at the school	40	Final Exam
	100	Total

Figure (2): the relative distribution of the tools in the assessment document.

Gamification as an AAssessment Tool:

What attracts students to games more than lessons and curricula are the motivational and challenge-based elements that are lacking in the curricula. The curricula will not reach the level of attractiveness of games unless they get out of their boring stereotypes and enter the worlds of stimulation by merging them with elements that make playing attractive and desirable (Hanus & Fox, 2015; Kreet, 2017; Sanmugam, 2017). The report issued by the Omani Education Council stressed the need to use gamification in education, and the importance of adopting projects based on gamification in the field of education, because the current assessment tools are no longer effective at the present time. The council called for reducing the density of materials and focusing on how to acquire the required skills. Through innovation (Education Council, 2019). A number of studies indicated the importance of gamification in the educational process and the importance of using it as a tool for assessment (Al-Qazzaz, 2018; Al-Qayed, 2015; Erenli, 2013; Hanus & Fox, 2015).

With the great technical development in education processes, many terms related to assessment appeared, such as electronic assessment, distance assessment, and self-assessment. The researchers believe that the gamification approach may combine these three types of assessment. The electronic assessment consists of the use of data networks, computers, educational software and multi-source learning materials, through applying the using of assessment methods to collect and analyze students' responses, which helps teachers discuss and determine the effects of educational programs and activities to reach a

standardized judgment based on quantitative or qualitative data related to academic achievement" (Zaher, 2009, p. 292). Distance Assessment is also defined as: "The educational system in which the teacher, the learner, and the book are being separated in the education environment, whereby the traditional environment is transferred from a school, university, etc. to a multiple and geographically separated environment" (UN, 2020, p. 5). Self-Assessment is defined as: "students' participation in defining the levels and criteria for the purpose of applying them to their work, and issuing judgments related to the extent to which they achieve these provisions and levels" (Ministry of Education, 2021, p. 5). The researchers see the need to introduce gamification to support some assessment tools , using a funny and exciting technological interactive platform, which is confirmed by several studies that indicated the need to remove the word assessment associated with something terrifying in students' minds and change it into something funny using the fun factor (Arnold, 2014; Barata et al., 2013; Sanmugam, 2017), Alsawaier (2018) also indicated that the introduction of a game-based assessment system will help teachers deal with their lessons with the least pressure and the greatest speed.The teacher can make sure that he completes the assessment of his students according to their potential and abilities. This way, the students get challenge themselves, away from being distracted by the grades and the concerns of failing in the subject (Sanmugam, 2017). The researchers see the importance of a good design of the gamification-based assessment tool, so that it achieves integration between fun and learning, in order to achieve continuity in learning and develop their internal motivation, which reflects positively on the development of learning among students.

The Most Important Elements of the Gamification Approach in Education

Despite the effectiveness of the gamification approach in general in the education field, many studies preferred to study specific elements in gamification and verify its effectiveness in various aspects, such as raising motivation for achievement, achieving integration, and raising the level of achievement (Alsawaier, 2018; Sailer & Homner, 2019). For example, some studies have indicated the effectiveness of medals and badges in the field of education, such as raising the level of school integration (Ibanez et al., 2014) and developing motivation (Dicheva et al., 2015; Kapp, 2012; Werbach & Hunter, 2012). The

study conducted by Bakhanova et al. al)2020) concludes that the leaderboard and points helps meeting the needs related to self-efficacy, while the avatar (avatar), storytelling (game scenario) and social interaction represented in cooperation and constructive competition contribute to achieving the needs of autonomy and interdependence, which are the three components of the self-determination theory referred to above. Reiners & Wood (2015) indicated that the most known elements are the levels, honor boards, medals, and points, which are referred to in the literature with the symbol (BLAP), whereby the symbol refers to the first letter of each element; badges, levels/leaderboards, achievements, and points).Rapp (2015) conducted a qualitative study to identify the impact of some gamification elements on users of some popular applications based on gamification strategy. The study indicated that there is a lack or an absence of some of the main elements of the gamification strategy in these applications, such as: diversity in the levels of stages and levels, and meaningful rewards, which was reflected negatively on students' motivation and enthusiasm to complete these applications in the study.

Based on the above, it turned out that the elements of gamification may serve as indicators of their effectiveness in submitting a proposal to develop some school assessment tools so that they are linked to the elements of gamification, which contributes to transforming student assessment from the traditional assessment that may cause tension and anxiety among students .Sanmugam (2017) confirms the foregoing as he believes that adding some gamification elements can have a role in increasing motivation, integration, and fun, as these results can be used as a guide for the practical applications of the elements of play. Jakubowski (2014) also presented a set of other proposals on how to use gamification as a tool for assessment for a successful application. He stated that the assessment method can be modified by grades to the method of experience degrees, and grades can be added to the student after he performs the activities, tasks and duties required in the application based on gamification, and that the term (homework) can be replaced with other termsthat are more attractive to the student, He added that the method of dealing with students in traditional classes can be changed to take the form of adventures and puzzle-solving. From the foregoing, it is clear that the design should be effective and accurate, based on

educational recommendations, and that each element of gamification should be studied, to check its effectiveness by referring to the various literature related to this subject.

The problematic of the study:

The education is deemed to be vital to the progress of the state, and hence, should be given utmost importance. There has been a lot of discussion in recent years regarding student achievement, and this can be verified from the results of achievement in the study of international trends in science and mathematics (2019). The indicators of achievement in The Sultanate of Oman is below the level of the standard central point (500 points), and there is still a gap between the achievement level of females and males in the Sultanate of Oman in science, as females outperformed males by a difference of 24 points.The Sultanate of Oman is ranked fifth internationally in the difference between the level of Gender in science (Ministry of Education, 2020).Accordingly, It turned out that gender differences are also considered as one of the important issues in teaching science that decision-makers must find solutions to. Therefore, a different approach must be found, whether for teaching or evaluating students (Sanmugam, 2017). The researchers believe that integrating technology in education and using it in teaching and assessment, using gamification-oriented elements, and gamification-based phone applications can contribute to solving the problem (Asawaier, 2017).

The current study seeks to present a proposed model on the use of the gamification approach to develop some continuous assessment tools in the Sultanate of Oman. This is encouraged by the lack of transparency in many assessment tools during the distance teaching period during the Corona pandemic (COVID-19), such as homework and practical activities.

The Aim of the Study and THE Questions Raised:

The current study seeks to provide a proposed model for developing some school continuous assessment tools using the gamification approach, and specifically it aims to investigate the following main research question:

- What are the stages of implementing the gamification approach as a suggested tool for developing some school assessment tools?

Where the following two questions arise:

1. What are the theoretical foundations of gamification (the concept of gamification / elements of gamification / theoretical foundations and models of gamification)?

2. What are the stages for implementing gamification as a suggested tool for developing some school assessment tools (homework - practical activities)?

Significance of the Study:

This study derives its importance from the novelty of the subject of gamification, and being one of the most important modern trends in the field of educational technology, which contributes to presenting ideas in both the theoretical and practical aspects. From the practical side, the study seeks to present a proposal to develop some assessment tools such as traditional homework and scientific activities, and also seeks to help the student to learn according to his potential and speed of learning. Finally the study seeks to create an educational environment that caters with requirements of 21st century.

Study Limitations:

The study is limited to a theoretical study to reach a proposed model for developing some assessment tools used in the Sultanate of Oman using a mobile application based on a gamification approach, namely (practical activities and homework).

Study Methodology and Design

With regard to the proposed model for developing assessment tools based on gamification, the researchers based its construction on the conceptual framework, which is one of the methods used in the descriptive approach, and is considered as the most appropriate method for building and organizing theoretical models and frameworks, and analyzing and describing theories (Abu Seif, 2017). The theoretical model is "the researcher's drawing of his research idea, which is represented in the main question of his research based on the literature review and his personal experience". (Abu Seif, 2017; Regoniel, 2015).

Terminology of the Study:

The study includes a set of terms that the researchers consider necessary to define and clarify, according to the context of the procedures in which this study was carried out, namely:

* Theoretical model: "An integrated process that links the variables under study through a graphic design or in a narrative form, through a conceptual framework to represent the main components of a subject of study that shows their interrelationship or links. It also leads to a common understanding of the variables that should be included in the assessment, and it provides a basis for scientific analysis in a logical way in a comprehensive assessment" (Sharpe, 2003, p. 45).

* Learning by gambling: "Using the rules and laws of playing games (points, medals, titles, levels) and the outcomes of participating in games (excitement - motivation - continuity - reward) in motivating users (parties concerned with the service or product) by classifying them as players (social - explorer) -....) in areas other than play (education - marketing - training). (Abu Saif, 2017, p. 371) In the current study, it is defined procedurally as: the application of basic gamification elements (leaderboard, medals, points, and progress bar) in a phone application that includes the outputs of the eighth grade in the Sultanate of Oman, which take the form of experiments, scientific investigations, and scientific questions of various levels.

* Practical activities: "It is a group of practical scientific activities and collective or individual laboratory experiments carried out at school in the laboratory or in the classroom or outside the school during a scientific trip or visit that involves students to achieve appropriate educational outcomes." (Omani Ministry of Education, 2021, p. 25).

* Homework: "It consists of assignments from the curriculum determined by the teacher whereby the student is required to perform them in his spare time at home or at school without the teacher's supervision, provided that the teacher takes into account their appropriateness to the level of each student, and to be corrected accurately and the student should be informed of his mistakes" (Omani Ministry of Education, 2021, p. 29).

Study Tools:

Mobile application:

The two researchers studied many education design models that support e-learning patterns, mobile learning in general, and gamification in particular. It was found that there are many common stages among them, especially those related to the process of designing

and producing educational materials and using them in the educational situation. Among these models: the Ashur model (ASSURE), the Dessouki model for diffuse learning, the ADDIE model, and Gerlach & Ely's model (Abu Seif, 2017; Al Qazzaz, 2018; El Hefnawi, 2017; Qarni & Abu Seif, 2016;), in addition to models that support the gamification such as the Di Tomasso model and the Werbach & Hunter model (Abu Seif, 2017; Qarni and Abu Seif, 2016). Uponreviewing the literature and previous studies, both researchers decided to design a special model for gamification in the educational aspect, specialized in developing assessment tools, since most of the models were focused on gamification in the aspect of entrepreneurship or in general.Figure (3) presents a diagram of this model, and the following is an analysis of the elements related thereto:

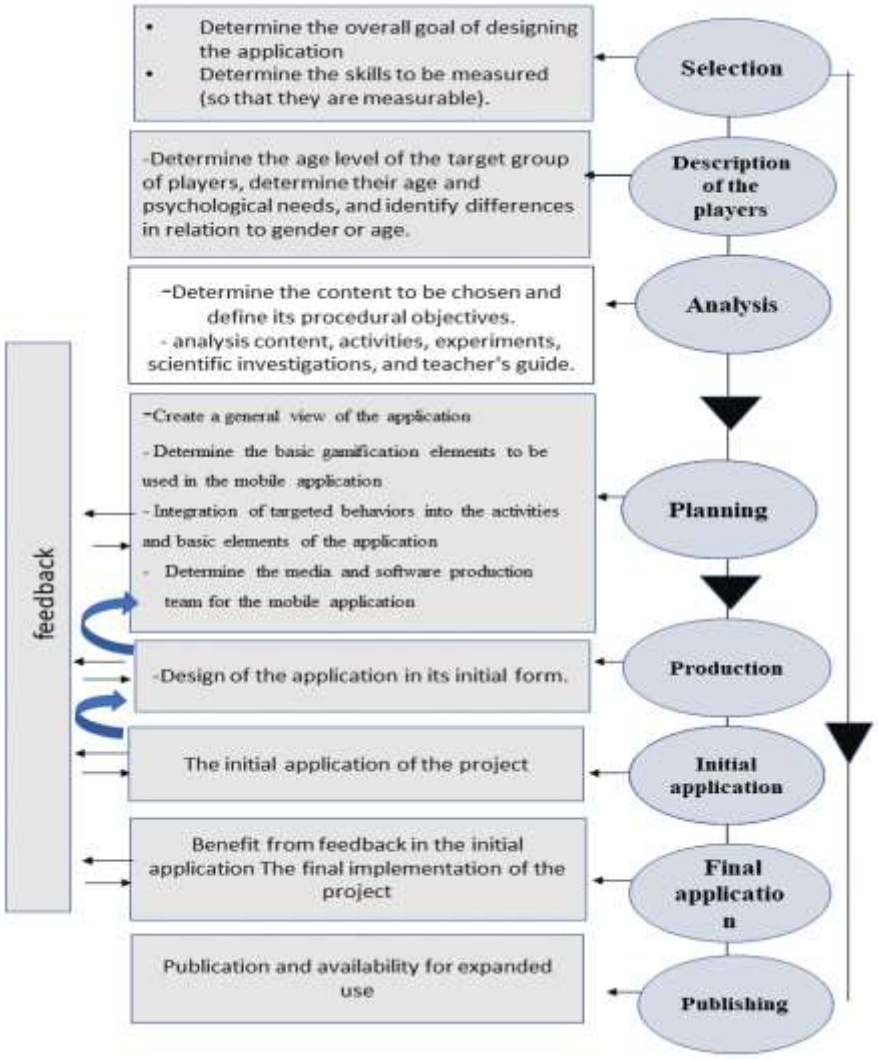

Figure (3): Proposed model for the use of gamification in education

The following details each stage:

The first stage: selection

At this stage, the general objective of the project, and the skills or knowledge to be acquired by the studentsbare determined. The focus of this study, will be presenting a

proposal to develop some assessment tools using gamification, which consist in homework and practical activities.

The second stage: description of the players

At this stage, the psychological and age needs of the students are determined by selecting the appropriate elements for them according to their playing styles. Therefore, the researchers stress the need to focus on the design of the application being comprehensive so that it covers most of the students' needs. Werbach & Hunter (2012) referred in their book to Bartle's MMOG model, where players were divided into four styles, and player attributes were used as an early indicator to determine the individual needs of students. By applying the model, it is possible to identify what drives and motivates students during the use of gamification in the learning process. Thus, students can be seen as having the characteristics of achievers, explorers, socializers or killers (Aldemir et al., 2018; Kreet, 2017; Sanmugam , 2017; Qarni & Abu Seif, 2016; Werbach & Hunter, 2012). Figure (4) presents a breakdown of each pattern:

Killers	Socializers	Explorers	ACHIEVERS
This type of player seeks to inflict defeat on others. They love the challenge and love the atmosphere of competition. The integration of this category of students can be achieved through progress in the game, or advancement in the leaderboards so that they feel that they have overcome and defeated the rest.	This type of players chooses games for their social aspect, as they are highly social people and feel pleasure by interacting with others, and for them playing is a tool for communicating with others, and they prefer to work in a team. They work in social groups and prefer being in in-app rooms to compete for the leaderboards	This type of players seeks to search around them for everything interesting, as they seek to discover everything that is new and different, and they are passionate about discovering the unknown, and learning about hidden areas, so it is not primarily concerned with earning points and levels as much as Discovering everything new.	This type of player prefers to accumulate points, progress in achievement levels, and open new stages in the game. They also strive to obtain rewards, even if they are symbolic rewards. They seek to show off the rewards, gifts, and achievements they have collected. The best practice for them in gamification is a visual list of their achievements, leaderboards, obtaining badges, obtaining more points,

Figure (4): players patterns

Third stage: analysis

At this stage, the content and procedural objectives, activities, assessment questions, teacher's guide, and experiments are analyzed.The experiments or questions that will be included in the application are redesigned. The focus is put on the diversity of images, the

use of attractive images, and the construction of the assessment scenario in an attractive way that includes interesting transitional stages. Focus should also be placed on designing the questions and the scenario of the experiments, taking into account the types of the players as much as possible.

Stage Four: Planning:

This stage is considered one of the most important stages and can be divided into a set of steps as follows:

A- general outline of the program design: It includes making a plan for how to design the program, and begins with designing the conceptual framework. For the current study, Figure (5) refers to the general conceptual framework for the gamification-based learning and assessment model, which includes the general objective of the project, consisting in presenting a proposal for the development of some assessment tools using gamification.

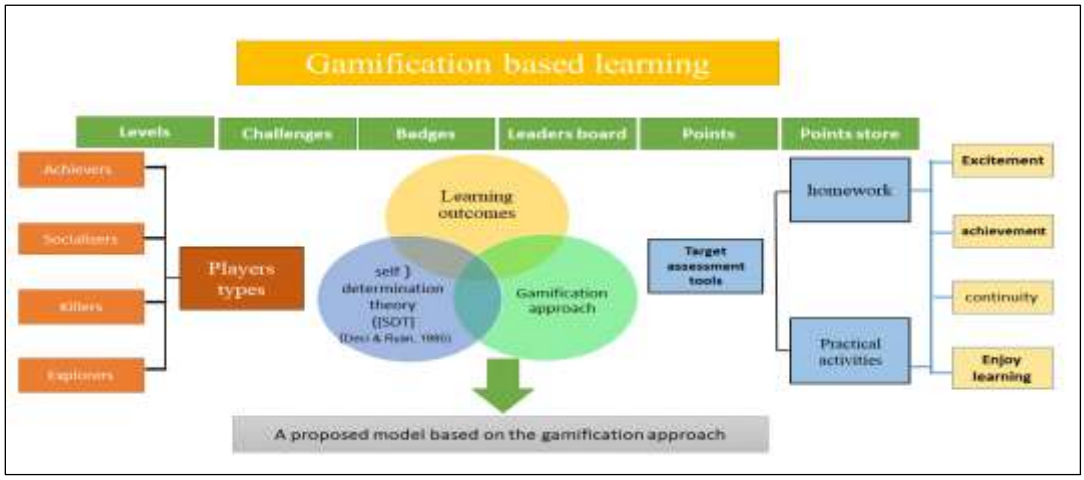

Figure 5: The general conceptual framework of the study

B – Application Interface design: The following is a description of the most important interaction interfaces in the application:

The application is designed to serve as an effective tool for assessment and to be one of the most important main mechanisms of gamification, which are the points counter, gradation in stages, progress bar, points store, honor board, and medals list. The application also included the section named (I know), which includes a large group of questions, It was divided into stages. Each stage represents a lesson in the science book, and each stage includes 10 different questions that are graded in levels, from the easiest to the most difficult. The application includes 20 stages in the eighth grade, in addition to the lessons prescribed by the Omani Ministry of Education. The researchers believe that this section of the application can be an alternative or a supportive tool for homework, in which the student answers the questions, and the teacher's control panel shows the grade that the student obtained at each stage. Figure (6) shows the (I Know) interface within the application.

Figure (6): I know interface

The application also consists of a section named(I am exploring), which includes (20) scientific surveys from the topics included in the curriculum for the first semester of the eighth grade. Each experiment in the curriculum has been developed and added to the application. It has been modified to enable the student implements the experiment in the classroom and enters the results into the device, according to a distinctive scientific methodology.

* The title and purpose of the experiment: the student reads the title, which has been changed to be more attractive than the titles of the experiments in the textbook.

* What do you expect?: Following the title of the experiment is (the what do you expect?) list , in which a question is asked to the student before starting the implementation of the experiment, so that he answers it through his previous experience. This part is considered important to stimulate the students and to reveal their alternative perceptions, as in (Fig. 7)

Figure 7: the (What do you expect?) interface

* Executing the experiment: After sending the answer in the (What do you expect) section, the student moves to the (experiment implementation) section, where the student implements the experiment with the teacher after presenting the tools and materials required to implement such experiment. Then he shows them the steps of implementing the experiment, so each group implements the experiment in class then each group answers the questions related to the experiment in the application, as defined in Figure (8)

Figure (8): Experiment Implementation Interface

* Results of the experiment: The student enters the results of the experiment in the form of answers to continuous assessment questions, and the question (what do you expect) appears

to him again, and he answers it again after identifying the correct answer or to compare the results.

* The young researcher interface: After completing the experiment, the student moves to the young researcher interface, where a set of questions appears for students from the higher levels of thinking, so that the student can answer them in class or as a completion of the practical activity at home. (Fig. 9).

* What I Learned interface: In it, all the information that was discussed in the experiment is summarized, and after completion, 5 points are transferredto the student's balance. The researchers believe that this section can be used as a supportive tool for formative assessment of practical activities.

(Fig. 9): The young researcher interface

The fifth stage: production: which is the output of the application in its initial status. At this stage a number of points are verified, namely:

• To achieve fun and entertainment during the learning process, and focus on accuracy and aesthetic design.

• That the accuracy of the questions, scientific experiments and images be verified and their validity be measured before being entered into the application. The accuracy of the questions and experiments has been verified in all scientific, linguistic and technical aspects.

• The elements of gamification should be diverse, designed accurately and serve the types of players. In the current study, the focus was on the most famous elements of gamification

mentioned in the educational literature, which are the leaderboards, points and development in stages and challenges, and the points store to exchange points for rewards and unlock achievement and medals. The four players' styles were taken into account, and what attracts each style was taken into account in the application.

• That the general objective of the mobile application based on gamification should be clear and the conceptual framework related to it should be clearly defined. In the current study, the study aimed to present proposals for the development of some tools. As for the assessment document for learning science for grades (5-9) in the Sultanate of Oman, it consists of a set of assessment tools, including: practical activities, oral dialogue, short test, homework, and final exam (Ministry of Education, 2021), and the researchers believe that these tools can be supported or developed using interactive tools based on gamification as follows:

- Practical activities tool: the application includes a number of 20 experiments, which are divided into two types: enriching experiments that the student can implement with his colleagues as a team outside the classroom, in addition toexperiments that students carry out in the classroom with the teacher as a team. The students get scored for practical activities after sending The works completed. What distinguishes this tool is the direct entry of the results related to the experiment, and the answer to the questions related to it. The student does not get the degree if a question or part is left unanswered.

Homework tool: It includes a set of questions, and the student plays and gets points for his correct answers, so that each stage includes 10 consecutive questions, and each stage represents a science lesson for the eighth grade in the first semester. The teacher can consider it as a homework support tool for students, what distinguishes this tool is the direct correction so that it reduces the burden of correction enshouldered by the teacher. The student can repeat the game and solve the questions more than once with the aim of increasing his balance in points, which may help to stabilize his information and correct misconceptions.

Sixth Stage: Initial Implementation of the Project:

The application is submitted to the jury who are experienced in the technical field and the design of mobile applications. In addition toto that the application should be tried with a school classroom, for a period of time, and then observations should be collected to benefit from them and to come up with the final form of the application. As for the current application, it was submitted to experts in the technical field to provide technical notes, and it was also presented to reviewers, supervisors and teachers to verify the scientific, linguistic and technical accuracy of the questions contained in the application. Finally, it was applied to a sample of students to verify its effectiveness, and it was modified and developed based on the observations received.

The seventh stage: publishing the project and continuing development and feedback

After taking into account the observations and feedback, and modifying the application, it can be applied to students in schools to verify the effectiveness of its use. The current project was applied to two grades from the eighth grade, and the opinions of students and teachers were excellent about its effectiveness as a tool for homework and practical activities in the continuous assessment. This stage includes continuous development and modification and benefiting from the feedback.

Conclusion and Recommendations:

The current study aimed to present a proposed model based on an application approach in developing some continuous assessment tools. The study answered the first question of the study as it showcased a comprehensive presentation of the theoretical foundations of gamification (the concept of gamification / elements of gamification / theoretical foundations and models of gamification). The second question was also answered through making a proposed model for using the gamification approach to develop some assessment tools, which are homework and practical activities. The student is free to choose the appropriate time and place to complete the tasks. The good design of gamification elements and their accurate employment is crucial as it might affect many students' psychological needs (Hanus & Fox, 2015). The current application was designed based on the recommendations of several studies such as (Aldemir et al., 2018; Rapp, 2015). The proposed application (Dr.Science) provided some ideas regarding the use of support tools for

homework and practical activities, which are two tools of continuous assessment in the Sultanate of Oman (Ministry of Education, 2021). What distinguishes the use of the application as a support tool for homework is the automatic correction of the student's work. The student evaluates himself before the teacher . It also saves the effort and burden of correction by the teacher, and the student has the freedom to choose the appropriate time and place for him to solve the assignment. Besides, the student can return the assignment to reach the satisfactory level. The application also provides immediate reinforcement tools represented in increasing points, advancing in the leaderboard and obtaining medals, as it provides immediate feedback to the student and does not wait for the teacher to correct the assignment and give him notes. In addition to that there are many attractions represented in colors and voice effects e that can attract the student to proceed with the solution. The electronic practical activities integrate the actual application of the experiments in the classroom with the electronic application. The student carries out the experiment and enters the results into the application, and answers the questions, which are corrected immediately. It also provides immediate feedback to the student. It also saves effort in correcting the activities. The practical activities form approved by the Ministry of Education does not give all the feedback that the student needs, nor does it include enriching questions or steps to ensure that the student follows up on the experiment and implements it accurately.

In light of the foregoing, the study recommends the following:

1. Applying standards for recognizing students' patterns in classrooms, dividing them in the class according to their common patterns, and taking into account the assessment to be consistent with their personalities.
2. Replacing traditional homework assignments with assignments that are based on a gamification approach, which saves the teacher effort and time in follow-up and correction, and allows the student to willingly accept the assignment.
3. Replacing practical activities and traditional practical projects in the assessment tools with practical activities and projects related to gamification, so that students work as a team and accomplish the tasks required fromthem.

4. Paying attention to medals in gamification-based applications, so that they are not traditional and inexpressive symbols (such as the gold and bronze medal), and it is preferable that they be linked to elements or symbols that the student likes, such as cartoon characters or real-life symbols.

5. Preparing training courses and workshops for teachers and supervisors on the mechanism of lesson planning and the application of programs based on the approach of gamification and its use in teaching. With the emphasis that the elements of gamification do not have to be virtual, but can be real and applied by the teacher in the classroom.

6. Teachers encourage students to use electronic applications based on gamification instead of electronic games.

7. Conducting studies on the use of the gamification approach as an alternative to traditional assessment tools and traditional homework so as to break out of the circle of traditional assessment tools.

8. Examining learners' perceptions of gamification intervention in education and their desire to do so.

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References

Abu Seif, M (2017). A proposed model for the use of gamification in electronic marketing of the services of the Egyptian University. *Educational Sciences*, 2, 364-438.

Abdulaziz M; & Al-Atoum, A. (2017). The effectiveness of a training program based on the theory of self-report to develop the social motivation of tenth grade students. *Journal of Al-Quds Open University for Educational and Psychological Research and Studies, 5*, 209-225.

Ackerman, C. (2018, June 21). *Self- Determination theory of motivation: Why intrinsic motivation matters.* https://positivepsychology.com/self-determination-theory/.

Aldemir, T., Celik, B., & Kaplan, G. (2018). A qualitative investigation of student perceptions of game elements in a gamified course. *Computers in Human Behavior, 78*, 235-254.

Al-Hefnawi, Mahmoud (2017). The effect of using electronic activities based on the principle of gamification in the light of standards to develop mathematical concepts among deaf students with learning difficulties. *Educational Sciences*, 4, 31-73.

Al-Qamish, M; Walboualis, M; & Maaytah, K. (2000). Measurement and assessment in special education. Amman: Dar Al-Fikr.

Al-Qazzaz, Monther (2018). *The effectiveness of employing educational electronic games based on smart mobile phones in acquiring and retaining technological concepts among tenth grade students* [unpublished master's thesis]. The Islamic University, Gaza Strip.

Alsaadat, Kh. (2017). Mobile Learning Technologies. *International Journal of Electrical and Computer Engineering, 7*(5), 2833-2838.

Alsawaier, R. S. (2018). The effect of gamification on motivation and engagement. *International Journal of Information and Learning Technology,* 35(1), 56-79.

Al-Zein, Hanan bint Asaad Hashem. The effectiveness of a proposed educational program for developing the skills of gamification design and employing it among higher e-learning diploma students and their perceptions towards it. *Educational Journal: Sohag University - Faculty of Education, 68,* 241-279.

Ambosaidi, A; & Al-Rashidi, Th. (2009). Difficulties in applying continuous formative assessment in the science curriculum from the point of view of a sample of science teachers in the Sultanate of Oman. *Journal of Educational and Psychological Sciences. 10*(2), 147-166.

Arnold, B. J. (2014). *Gamification in Education.* Paper presented at Annual American Society of Business and Behavioral Sciences (ASBBS) Conference. LasVegas, USA. http://asbbs.org/files/ASBBS2014/ASBBS.htm.

Bakhanova, E., Garcia, J. A., Raffe, W. L., & Voinov, A. (2020). Targeting social learning and engagement: What serious games and gamification can offer to participatory modeling. *Environmental Modelling and Software, 134***,** [104846]. https://doi.org/10.1016/j.envsoft.2020.104846.

Barata, G., Gama, S., Jorge, J., & Goncalves, D. (2013). *Engaging Engineering Students with Gamification.* In Proceedings of 5th International Conference on Games and Virtual Worlds for Serious Applications (VS-GAMES), (PP. 1-8*).* Poole.

Christian, D. D., McCarty, D. L. & Brown, C. L. (2020). Experiential education during the COVID-19 pandemic: A reflective process. *Journal of Constructivist Psychology,* DOI: 10.1080/10720537.2020.1813666

Dicheva, D., Dichev, C., Agre, G., & Angelova, G. (2015). Gamification in education: Asystematic mapping study. *Educational Technology and Society*, **18**, 75-88.

Erenli, K. (2013). The Impact of Gamification - Recommending Education Scenarios. *International Journal of Emerging Technologies in Learning (IJET), **8***, 15-21.

Freitas, F., Ribeiro, C., Brandão, L., Paulo Reis, F., Neri de Souza, F., & Costa, A. (2017). Learn by yourself: The Self-Learning Tools for Qualitative Analysis Software Package. *Digital Education, 32,* 97-117.

Hanus, M., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education, 80*, 152-161.

Huotari, K., & Hamari, J. (2012*). Defining Gamification - A Service Marketing Perspective.* In Proceeding of the 16th International Academic MindTrek Conference (pp. 17–22).

Hwang, G.-J., Sung, H.-Y., Hung, C.-M., Yang, L.-H., & Huang, I. (2013). A knowledge engineering approach to developing educational computer games for improving students' differentiating knowledge*. British Journal of Educational Technology, 44*(2), 183–196.

Ibanez, M., Di-Serio, A., & Delgado-Kloos, C. (2014). Gamification for engaging computer science students in learning activities: A case study. *IEEE Transactions on learning Teachnologies,7 ,* 291-301.

Jakubowski, M. (2014, March). *Gamification in business and education–project of gamified course for university students.* In Developments in business simulation and experiential learning: Proceedings of the Annual ABSEL Conference (Vol. 41).

Kapp, K.M. (2012*). The Gamification of learning and instruction: Game based method and strategies for training and education.* San Francisco, CA: Pfeiffer.

Kreet, N. (2017). *The use of players' patterns in competitive digital games in education without the need to bring devices into the classroom*. https://www.new-educ.com/new education

Ministry of Education (2020). *Student Learning Assessment Document: Science subjects for grades* (7-10). https://almanahj.com/om/id=1299

Ministry of Education (2020). *National Report of the International Mathematics and Science Study (TIMSS 2019).* Sultanate of Oman.

Oman Education Council (2019). *Read the report on Adopting Innovation in the Government Sector: Global Trends (2019). General Secretariat of the Education Council*. www.educouncil.gov.om

Lamprinou, D., & Paraskeva, F. (2015, November). *Gamification design framework based on SDT for student motivation*. Paper presented in 2015 International Conference on Interactive Mobile Communication Technologies and Learning (IMCL). Thessaloniki, Greece. Retrieved from https://ieeexplore.ieee.org/document/735963.

Landers, R. (2015). Developing a theory of gamified learning: Linking serious games and gamification of learning. *Simulation & Gaming, 45***,** 752-768.

Morschheuser, B. S., Rivera-Pelayo, V., Mazarakis, a., & Zacharias, V. (2014). Interaction and Reflection with Quantified Self and Gamification: an Experimental Study. *Journal of Literacy and Technology, 15*(2), 136–156

Oak, J., & Bae, J. (2013). Smart Multiplatform-Based CPR Game App Design. *Advanced Science and Technology Letters, 39,* 20– 23.

Qarni, O; & Abu Seif, M. (2016, January). *A proposed model for the use of gamification in Egyptian universities.* A working paper presented at the twenty-third annual scientific conference of the Egyptian Society for Comparative Education and Educational Administration, Faculty of Education, Ain Shams University, Cairo, Egypt.

Rapp, A. (2015). A qualitative Investigation of Gamification : Motivational factors in on line gamified services and applications. *International Journal of technology and Human* Short, D. (2012). Teaching scientific concepts using a virtual world - Minecraft. Teaching Science, 58(3), 55–58.

Raleiras, M., Viana,J., Costa,F. (2020, July 6-7). *Adaptive Gamification models in higher education: Is there a plase for self-regulated learning?.* EDULEARN20 Conference, Palma de Mallorca, Spain.

Reiners, T., & Wood, L. C. (2013). *Immersive Virtual Environments to facilitate authentic education in Logistics and Supply Chain Management.* In Y. Kats (Ed.), Learning management systems and instructional design: Best practices in online education (pp. 323-343). Hershey, PA: IGI Global.

Regoniel, P. (2015). *Conceptual Framework: A Step by Step Guide on How to Make One .In Simply Educate. Me*. http://simplyeducate.me/2015/01/05/conceptual-framework-guide/

Sailer, M., & Homner, L. (2019). The gamification of learning: A meta-analysis. *Educational Psychology Review, 32*(1), 77-112.

Sanmugam, M. (2017). *Effects of gamification on achievement, engagement and intrinsic motivation among students of different player traits in science learning, [*PhD thesis], Universiti Teknologi: Malaysia.

Seaborn, K., Fels, D.I., 2015. Gamification in theory and action: a survey. *Int. J. Hum. Comput. Stud. 74,* 14–31.

Sharpe, M. (2003). Conceptual Framework & Research Methadology, Chapter 2. Chinnese *Sociology & Anthropology,* 36, 42, 42-69. https://doi.org/10.1080/21620555.2003.11038332

United Nations (UN). (2020). *Policy brief: Education during covid-19 and beyond.* https://www.un.org/development/desa/dspd/wpcontent/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf

Werbach, K., & Hunter , D. (2012). *For the win: How game thinking can revolutionize your business.* Wharton Digital Press.

Zahir, Ismail. (2009). *Electronic courses: design, production, publication, application, and* assessment*.* Cairo, World of Books.