

# Enriching Learning Process by Gamifying Electronic Exam

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**Abstract**—In this work, the detail about gamifying the online exams are described. Features of this work obtained from game features to make students feel that they are playing a game. The constraints of the gamified exam and new tools which are added to the traditional online exam are introduced. In addition, the reasons for defining rewards or trophies are explained.

**Index Terms**—Electronic Exam, Gamification, Learning

## I. INTRODUCTION

FROM 25 years ago until now, we tried to develop education with entertainment, and the majority of studies focused on children. To date, creating a festive and fun atmosphere for all ages was noticed [1]. The concept of gamification has been used in various fields since 2010 when it is introduced, and quickly became widespread [2], [3]. In the field of education, a many works have been done and they tried to increase the engagement of the students by using games' features such as Awards and Leaderboard. For example, in the work by Berkling & Thomas [4], a map is provided for students to show their progress on the map, and a sense of playing a game is induced to motivate them. Gamification's main goal is to raise the engagement of users by using game-like techniques such as scoreboards and personalized fast feedback [5], and making people feel more responsible and purpose when engaging with tasks [6]. One of the features of the gamification is to increase user productivity [7], and also using gamified process, will cause partners to be aware of the progress of activities in other parts of the organization [8]. Although many studies have been done on education, there is a little study on the e-exams and gamification and they tried to increase students' motivation through using a trophy and Leaderboard system. In this study, it will be shown that by using a unique game element, namely hints, how it is possible to add new features to e-exams and make them a tool which help students in learning and transfer knowledge to them in addition to the assessment.

## II. GAMIFYING ELECTRONIC EXAMS

One of the problems which exist in traditional exams is they only used for assessment of students. Also, some students due to high stress, cannot show their knowledge perfectly at the examination time, and the obtained results would not be the real results [9] and they may have the knowledge but because of the

exam's stress they cannot answer the exam questions. On the other hand, if students during taking exams feel that they are playing a game, their stress can be descended. Consequently, when students taking the exam with low stress we can convey the proper knowledge to them and add the learning feature to the exam which used to be an assessing tool only.

For gamifying exams, game features and techniques must be used and be embedded to the traditional exam. One of the most important features of the games is giving rewards to the student after reaching to the predefined goal. Rewards should not be easily attainable, and should be achieved in such a way that always motivates students [10], [11]. Before defining the goals for getting rewards, it is vital to defining rules and constraints. Therefore, at first the constraints and rules will be explained and then rewards and the reasons for their existence will be introduced.

E-exams in this study are taken through the internet and students answer the questions in their home. No limitation in using books and time is considered for increasing students' motivation to study and also hints contain proper knowledge for students and these hints change a gamified e-exams to a tool for learning. Also, these exams were little exams which held during the second half of the school year. These e-exams held on mathematics and literature courses, and this gamified e-exams make the opportunity to gamify all the e-exams for other courses.

### A. Rules and Constraints

In this work, gamifying exam is based on teamwork. Thus, students divided into the 5 team and each team had 5 players. Members of the team selected based on their scores and records in the class. Designed questions in gamified exams have 4 hints, and each exam has 5 questions. In these gamified exams, students must earn scores to get rewards. In addition, scores are in 2 types; personal scores and team scores.

Every action on the questions, other than selecting the correct answer, will reduce the score of that question. Actions in addition to the answering, are passing and using hints. Students are able to pass maximum 2 questions from 5 to their teammates and get a little score from that question and if the pass receiver selects the correct answer, in total they will roughly earn the maximum score. Also, using each hint will reduce the score of the question. Considering hints in gamified exams cause students to learn the related knowledge to that question and do their effort to answer the question with that hint. In the table I the actions and the related score are shown. Using hints will reduce the potential point of the questions and students only can earn points if they select the correct answer or pass the questions.

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TABLE I  
SCORES OF ACTIONS FOR EACH QUESTION.

Action	Personal score	Team score
Correct answer (Maximum score)	24	7
Passing	8	1
Correct answer to passed question	15	5
Correct answer after using 1 hint	12	5
Correct answer after using 2 hints	8	5
Correct answer after using 3 hints	5	5
Correct answer after using 4 hints	2	1

According to the number of questions in each exam (5 questions), each exam will bring maximum 120 personal scores and 35 team score for students. In following, the rewards and their description are explained. Team scores calculated by adding each team-members' team score. So, the maximum team score is 175 which means each 5 team member should get 35 points.

**B. Rewards**

As mentioned before, the rewards must be defined based on goals. According to our goal which is enhancing learning during exams, gamified exams must force students to try their best and if they could not find the correct answer students are able to use hints and again try to answer the questions. Consequently, rewards defined as shown in table II. These rewards called as **Static Trophies**. If students earn this type of rewards, they will never lose it in the future. Five of these rewards determined based on the scores and encourage students to earn the highest score as they could.

As it is clear, two top rewards, with a crown shape, can be earned only if they get the maximum score. Earning these rewards make a challenge for students, which is an important element in gamification and it will motivate them. Also, the last individual reward which is given to the top 3 students in each exam is determined to increase the motivation of the students because in each exam they are able to be in top students and prove their excellence to others.

TABLE II  
STATIC TROPHIES OF GAMIFIED EXAMS

Static trophies	
Individual	Team
	
If at least 120 scores be earned	If at least 175 scores be earned
	
If at least 90 scores be earned	If at least 140 scores be earned

Static trophies	
Individual	Team
	
If being the top three students in each exam	If at least 125 scores be earned

Another type of rewards is **Dynamic Trophies**. Students and teams can lose these rewards if they are in lower than 3 in ranking. These rewards determined to motivate top students and top teams, and make them compete with each other. Dynamic Trophies are shown in table III.

TABLE III  
DYNAMIC TROPHIES OF GAMIFIED EXAMS

Dynamic trophies	
Individual	Team
	
If being the first top student in total exams	If being the first top team in total exams
	
If being the second top student in total exams	If being the second top team in total exams
	
If being the third top student in total exams	If being the third top team in total exams

رتبه	نام تیم	امتیاز
1	team	122
2	amirkabir	122
3	team2	107
4	team3	92
5	team4	60

رتبه	نام دانش آموز	نام خانوادگی دانش آموز	امتیاز
1	ali3	kazemi	820
2	ali3	kazemi	750
3	ali3	kazemi	710
4	ali3	kazemi	670
5	ali3	kazemi	658
6	ali3	kazemi	620
7	ali3	kazemi	610
8	ali3	kazemi	602
9	ali3	kazemi	599
10	ali3	kazemi	585
11	ali3	kazemi	575

Fig. 1. The image of the Leaderboard of this work which presents top teams at the first table and top students in the second table. The ranking of students and their team are shown by different color.

### C. Leaderboard

One of the indispensable features of games and gamified processes is Leaderboard [12]. Ranking students and comparing them cause students to know their place in comparison with other students. So, they will try to go higher in rank and compete with others or the exact student. Also, ranking team makes students feel more responsible for doing their exam and try to get the best result. In Fig. 1 the example of the Leaderboard of this work is shown. The rank of the current student showing in a different color. The first Leaderboard is team ranking and the second one is students ranking. Leaderboards show the whole earned scores in both courses. These Leaderboards will not be cleared until the end of the school year.

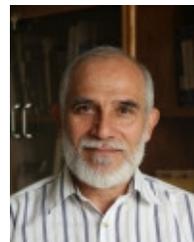
## III. SUMMARY AND CONCLUSION

To date, many works have been done about gamification in education. In this work, we explained the details of a gamified exam and describe all constraints and rewards. Also, it has been shown that how e-exams can be a part of the learning process by using the gamification in an appropriate approach. In addition, gamification elements make a better atmosphere for transferring knowledge to students. For instance, rewards determined based on the learning goal and tried to increase the motivation of the students. Also, some rewards considered to attract them to try their best, whatever they are in best rank or lower rank. In addition, Leaderboard makes students to compete with each other and try to defeat their opponent. In this gamified exam, students tend to do more exams in this gamified exam and it shows they had good motivation for taking exams. Also, in the final exams they earned better scores in comparing with the students which did not use the gamified e-exam. In this study, all

students had a proper skill in using computers and the internet, but a potential problem which needs more study is that students with lower skill in using a computer can decrease their motivation and it is an obstacle in this such works.

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