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Research Article

The Use of Gamification in Distance Education: A Web-Based Gamified Quiz Application[1]

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Abstract

One of the basic challenges in distance education is motivational issues that distance learners encounter because of the factors such as separation in time and space from teachers, other learners, and learning sources. In an effort to minimize this drawback and increase learners' participation into learning processes by motivating distant learners, new approaches such as gamification have been integrated in distance education. Gamification is one of the

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motivational approaches to meet this need. Gamification is defined as the application of game elements and digital game design techniques to non-game situations to engage and motivate people to achieve their goals. Within this perspective, this study intends to explain the use of gamification by examining, SoruKüp, a gamified web-based quiz application designed for the use of distant learners. Within this context, the research used holistic multiple-case design which is one of the qualitative research model. The research data was collected through interviews with participants who used SoruKüp application and the data was analyzed using content analysis technique. Within the perspectives of the research, it has been argued that gamification in distance education enhances the learners' motivation, contributes to the sustainability of the learning process, and makes the learning process more fun.

Keywords: *Gamification, gamification design in e-learning, gamified web-based applications, motivation, open and distance learning.*

Introduction

Learner motivation is a key factor in learner achievement, retention of learning and learner interaction. Learner motivation is especially significant in distance learning. Distance learners' self-direction and self-regulation are highly important for attaining success and the planned learning output. Motivation is at the center of self-directed and self-regulatory processes. There are two types of motivation in the learning process: internal motivation based on learners' willingness and external motivation based on reward or the avoidance of punishment. Put simply, internal motivation arises from the learner, while external motivation stems from outside factors.

Distance Education and Motivation

An analysis of the definitions of distance education reveals that the majority focus on the fact that learners are separated in time and space from teachers, other learners, and learning resources (Simonson, Smaldino, Albright & Zvacek, 2003; Moore & Kearsley, 2005). In distance learning contexts where students are at the center, being a self-disciplined learner and having high levels of motivation are important factors that determine the learning output. While high levels of motivation increases learner satisfaction, low levels of motivation increases students' risk of leaving the distance learning platform (Park & Choi, 2009). Ensuring that learners have high motivation levels is highly important to achieve learning outcomes (Bozkurt, 2014; Ucar & Kumtepe, 2018).

Distance between learners and teachers is usually seen as a limitation that leads to lower motivation levels and negative situations in learning processes. A study by Sankaran and Bui (2001) has shown that highly motivated learners are successful both in distance and traditional learning environments. In this respect, it could be argued that increasing distance learners' motivation levels is necessary for obtaining richer learning output. At the same time, the relationship between technology and learning processes may not be effective in terms of increasing motivation and making it sustainable. This makes gamification design stand out as an appropriate way to increase students' motivation.

Gamification

Gamification is the application of game-design elements and game principles in non-game contexts (Deterding, Sicart, Nacke, O'Hara & Dixon, 2011). Werbach and Hunter (2012) have developed a three-category model of gamification. These categories form a pyramid structure comprising dynamics, mechanics and components (Figure 1).

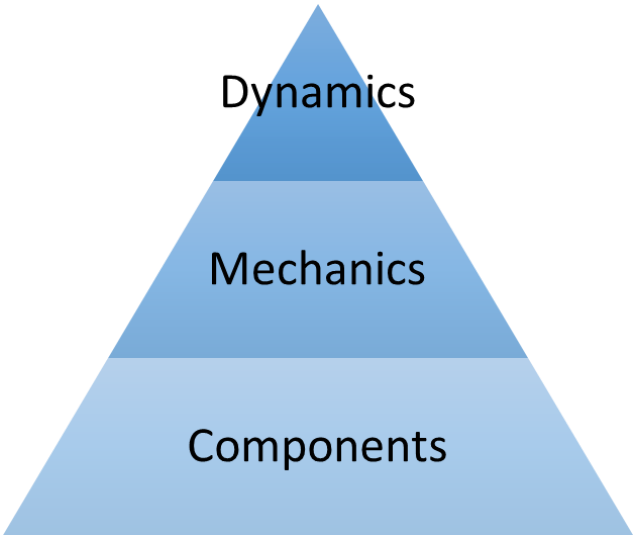

Figure 1. The gamification model and its components (Werbach & Hunter, 2012)

Dynamics: Gamification dynamics are the basic principles that guide the gamification design.

- Constraints
- Emotions
- Narration
- Progress
- Relationships

Mechanics: These elements define more observable aspects of the gamification structure..

- Challenges
- Chance
- Cooperation and competition
- Feedback
- Resource acquisition
- Rewards
- Transactions
- Turns:
- Win states

Components: These are the most striking elements of gamification. More than one component can be used in relation to a single gamification mechanism.

- Achievements
- Avatar
- Badges
- Boss fights
- Collections
- Combat
- Content unlocking
- Gifting
- Leader boards
- Levels
- Points
- Quests
- Social graph
- Teams
- Virtual goods

Gamification and education

Because of the some limitations in distance education processes, new approaches are needed to sustain learners' motivation. In this context, gamification activates the motivation that directs learners to study more (Muntean, 2011), leads learners to be more active, reinforces behaviors for cooperation and achieving goals (Glover, 2013). The tendency of e-learning environments to reflect gamified designs effectively, the ability to integrate gamification in e-learning processes easily, and the opportunity to make the gamification elements in the interface concrete through visualization make gamification as a suitable approach for e-learning (Bozkurt & Genç Kumtepe, 2014).

The Related Literature

Shi, Cristea, Hadzidedic and Dervishalidovic (2014) argue that gamification has the potential to increase learners' internal motivation in e-learning processes. Similarly, Krause, Mogalle,

Pohl and Williams (2015) found that gamification contributed to online learners' rates of participation in the learning system. Mozelius, Collin and Olsson (2015) stated that online environments visualized with gamification elements contribute to learners' online environment perceptions. Amriani, Aji, Utomo and Junus (2013) reported that gamification did not influence student participation in e-learning environments, but that when gamification elements were not present, this led to a significant difference in student performance. Lamprinou and Paraskeva (2015) reported that gamification increases learner motivation in online learning environments and contributes to reaching learning objectives. Gañán, Caballé, Clarisó and Conesa (2016a, 2016b) and Jimenez, Caballé, Clarisó and Conesa (2016) studied the gamification of e-learning platforms and found that learning analytics may be effective in gamification design processes.

Research Questions

The main aim of this study is to determine the usability of gamification practices. It sought answers to these questions:

- What are the distance learners' opinions about the gamified test application?
- How does the gamified quiz application influence the participants' motivation?

Methodology

In this section, the research design, sample, data collection procedures and the analysis methods were discussed.

The Research Design

This case study aimed to investigate the role of the SoruKüp application, which is used as an online quiz application enriched with gamification elements in Anadolu University's Open Education Faculty and to identify user opinions about improving it. As a qualitative method, case study is defined as, "the thorough description and analysis of a system" (Merriam & Tisdell, 2015). The researcher examines one or more specified cases thoroughly based on data from various resources and reports the case-related themes within a certain time period (Cresswell, 2007). The researcher interacts with the participants in natural environments where

the research takes place and examines a certain situation or situations. The concept of a case may be an individual or group, an institution or an environment (Yıldırım & Şimşek, 2011). The steps to be followed in case studies are similar to those of the scientific research process: specification of the research questions, the sub-questions, the analysis unit, the topic to be investigated, the participants, data collection, data interpretation and reporting the case study (Yıldırım & Şimşek, 2011).

According to Yin (2002), the case study approach in education studies especially aims to answer the questions, how and why. The researcher should determine a case study design suitable for the research questions and method prior to the research process (McMillan, 2004).

This study adopted the holistic multiple case study design. In holistic multiple case studies, each case is considered as a whole framework in itself and then compared with each other. Holistic multiple case study design is generally used in studies of innovations such as a new educational programs, activities or technologies (Yin, 2002), making it appropriate for this study's investigation of opinions about the use of the SoruKüp application. To do so, the distance learners' opinions about gamified application elements such as level, ranking, multi-player structure and random card selection were analyzed individually, and then their effects on the whole system were considered holistically.

Participants

The sample included students who used the SoruKüp, a web-based quiz application, in Anadolu University's Open Education Faculty in the 2015 fall semester. Purposive sampling with maximum variation was adopted. The rationale for purposive sampling is to have data-rich cases for carrying out in-depth research (Patton, 1990). In addition, in samples with maximum variation, it is possible to understand whether there are any similar or different situations among various groups, and expose different dimensions of the problem based on this variation (Yıldırım & Şimşek, 2011). The system records of the SoruKüp application were used to determine the sample. Learners from Anadolu University, Open Education Faculty, Business Administration Faculty who used the application at high, medium and low frequencies were selected. It was aimed to increase the widespread effect depending on the number of students in the selected department and class. Forty participants were invited to take part in the

interview, and 26 of them agreed to do so. The age range of the study group, which consists of 15 female and 11 male participants, varies between 20-46.

Data Collection

The data collection instruments included semi-structured interviews carried out face to face or through tele-conferencing, system records tracking user logs in the SoruKüp application and researcher diaries. Since people's feelings, ideas and intentions cannot be directly observed, the most suitable method for collecting this kind of data is interviewing (Patton, 1990). When preparing the interview questions to gain information about the users' perspectives, the research questions and sub-problems were taken into consideration. These questions were prepared on the basis of expert opinion and the relevant literature. The semi-structured interview form with open-ended questions took its final form after consulting expert opinion. Interviews recorded with the participants' permission during the interview and the researcher's notes formed the data set.

Data Analysis

Data analysis included the participants' responses, combining what the researcher saw and read, and summarization and interpretation, which were subjected to content analysis (Merriam & Tisdell, 2015). After the semi-structured interviews with the participants were recorded, these recordings were transferred to the computer environment. The emerging themes were coded and supported with related quotations, and content analysis was completed according to the guidelines of Yıldırım and Şimşek (2011) and Creswell (2013).

Validity and Reliability

Some precautions were taken to prevent any factors from threatening reliability and validity. During the preparation of the open-ended questions on the data collection instrument, the relevant literature was reviewed and expert opinion was obtained on gamification, e-learning and motivation in learning. Prior to the interviews, the participants were informed about the procedures. Participation in the interviews was voluntary, and the participants' information was kept confidential. The interviews were recorded, and the researcher took notes at the same time. All of the data were stored to maintain verifiability. Three researchers performed the data

analyses, and coordination was maintained between them. When necessary, the participants were contacted again to confirm data. The report was prepared in detail so that the study can be transferable. The researchers have been actively involved in the design of the SoruKüp application, preparation of the data collection tool, collection of data, analysis and reporting.

The Research Context

SoruKüp, which was developed for the use of Open University students, is a web-based quiz application enriched with gamification. The application can be accessed via Facebook. It uses Node.Js, PHP and MySQL technologies in the background and HTML5 as its interface. The application is supported by contemporary operating systems and works on smart phones, tablets and computers.

SoruKüp was designed as a multi-player information contest and has the following elements:

- Real-time multi-player competition system
- Post-competition ranking system
- Motivational feedback system based on competition results
- Scoring system
- Level system based on performance
- General ranking system
- Social interaction opportunities
- Making the content concrete with cards
- Chance factor

Users who enter the application are directed to a page named "Update." This page is shown in Figure 2. It shows recent users, success rank in the last game, the top 42 players and recent news related to the application.

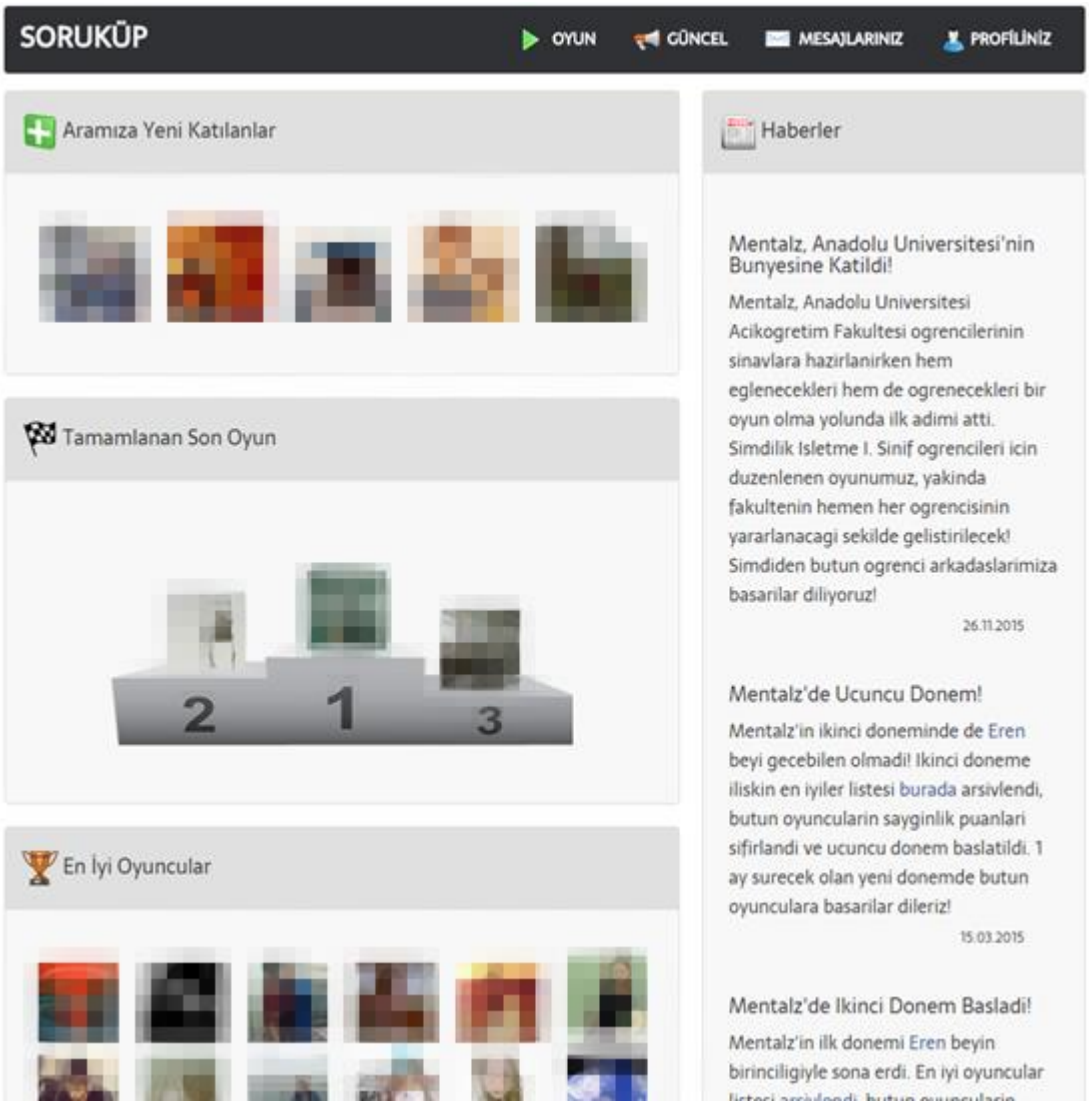

Figure 2. SoruKüp's page tagged "Update" (User profile pictures were blurred to protect privacy.)

A visitor who visits the application can click on the "Game" button and enter the web page of the knowledge contest. Later, they can reach the competition room using the button tagged "UseToken and Start."

As soon as four users have entered the room, the activity will automatically start. After a certain period, if four people cannot be gathered in the room, bot characters will enter so that the users need not wait for a long time.

The feature that distinguishes this activity from other knowledge contests is its card structure, in which every unit has been transformed into a card for gamification purposes. The visuals for

a unit, the unit title and the course name can be seen on the cards, an example of which can be seen in Figure 3.

Figure 3. Sample question card

When the activity starts, the system asks the learners to randomly select three cards out of 50 and display them in the room. After the cards are displayed, the player is asked to choose a card. After the card selection is completed, the selected card can be seen by all users and a question related to the unit is displayed. All the users in the room are required to answer the question within a certain amount of time. Their responses can easily be seen, the correct answers are explained and the scores are announced. The scores depend on the correctness of the answer and response speed.

Next, three new cards are selected and distributed. With every distribution, the right to select a card passes on to the next user. Card distribution, card selection, posing the question, giving the answer, and scoring the answers are repeated four times and the users in the room are ranked based on their scores and each of them are given feedback by the system. The merit score used in the general ranking in the game is determined based on their score at the end of the game. The merit score also determines the user's level.

The "Profile" page specific to each user is also highly significant. This page can be accessed by clicking on the users' photographs and includes data related to the user's level, scores, results of the last game and general ranking. It is also possible to write a message to the related user via this page. Messages can be seen and answered in the "Your messages" section.

As discussed previously, the SoruKüp application is a quiz activity enriched with gamification elements. In this respect, it could be argued that this provides a fun environment that has the potential to increase motivation to do exercises. The evaluation of the application by the users will contribute to the gamification literature and the development and dissemination of the application.

Findings and Discussion

This section will discuss user opinions of the gamification dynamics, mechanics and components of the SoruKüp application (Figure 4).

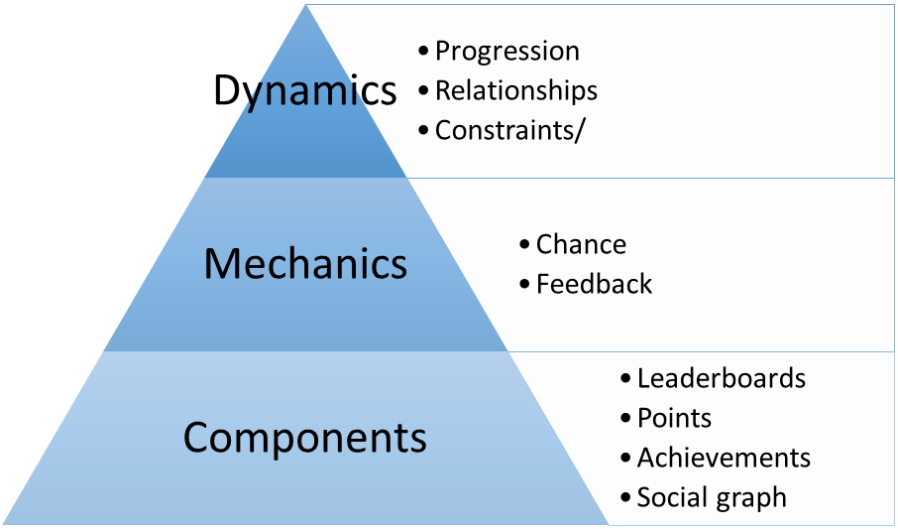

Figure 4. Gamification dynamic, mechanic and components

Leader Board

In the online interviews, the extent to which the leader board influenced learner motivation was assessed using the question, "Did you notice the rank system in the game?" The responses revealed that the leader board motivated the learners to play more and reinforced the sense of competition among the participants. The participants also mentioned that they had the chance to do more practice while trying to rise to a higher rank. Another interesting finding was that seeing oneself or other participants on the leader board promoted the perception that the online environment is a social context. The leader board is also significant in terms of seeing one's own level in a gamified social platform. The participants see the leader board as an instrument of evaluation and use it to learn about their level in comparison with others. Considering the

fact that distance learners are far apart, the leader board can be used as a self-evaluation tool and increases the perception that there is a social learning environment where there are other learners. Still, some participants said that the rank system did not motivate them. Here are some of the opinions expressed by the participants in the interviews:

> *"The rank system got my attention. It influenced my motivation positively. If I rank fourth in a game, I want to play more, wondering why I performed poorly." [P11]*
>
> *"The rank system is interesting, and it motivated to be more successful. I want to be in the highest ranks." [P6]*
>
> *"I think it will be good in terms of doing practice. I wanted to be in the higher ranks. But this has to do with me. I wanted to see my position, and what else I could do." [P28]*
>
> *"The ranking system is interesting, but it did not influence my motivation because it is nothing like a normal game. If there were no rank system, I would still play it again and again." [P8]*

Analysis of the participants' experiences of the leader board shows that it meets some important learner needs. It positively affects self-direction (Smith, 2001) and self-regulation (Palloff & Pratt, 2003), enables learners to evaluate themselves (Schunk, 1996) and the presence of other participants in the leader board promotes the idea of a social presence (Short, Williams & Christie, 1976).

Points, Achievements, and Progress

Another interview question asked about the extent to which gamification components, that is, points, achievements and gamification dynamics, influence learner motivation. The progress, achievemnts and points dimensions are presented to SoruKüp users in a single design. The participants were asked "Did you notice the level system in the game?" The scoring system is a meaningful application for making the participants' progress concrete. New levels were opened as a result of the scored points, and this provided the opportunity to reach an abstract achievement. From a complementary perspective, the progress dimension was seen as the driving force by the participants and enabled them to have a sustainable experience with the gamified application. Here are some of the related opinions stated in the interviews:

> *"The level system is ... how can I say it, the driving force in the game. But the ranking becomes more challenging as more levels are passed because you need to*

> *collect more merit points. That is somewhat demoralizing, but of course it should not be easy to pass levels in the game." [P28]*
>
> *"That also had a positive effect because as you progress you see your own level, and when you play with other players you see their level. That was also a good aspect of the game." [P12]*

One of the greatest difficulties with distance learning is high drop-out rates (Berge & Huang, 2004; Tyler-Smith, 2006) and rates of completion of the lower level system (Herbert, 2006). In this regard, it can be said that gamification has a positive effect on lessening drop-out rates by increasing learner motivation and thus supporting the sustainability of the learning process.

Social Graph

Another interview question was the social graph component that enables communication and interaction. The participants were asked, "Did you text other users?" The participants did not feel the need to use the messaging function, and many participants stated that the messaging feature was disturbing. Another point that was discovered in the interviews was that the players were not aware of the messaging feature since they did not need to text other players. Here are some of the opinions expressed by the participants in the interviews:

> *"I never felt the need to contact other players, when they contacted me, there were some bad things in the past, and I made the necessary complaints. I never felt this need, when they asked to contact me I declined the offer. I never felt the need to do it." [P28]*
>
> *"No, I did not contact them. I don't mind having such a feature. Some might use it. It is a personal choice." [P12]*
>
> *"No, no. I am kind of against such things." [P1]*
>
> *"I did not see any message. Messaging would be fine but might also change the aim of the game. It can be both an advantage and a disadvantage. I guess the game was normally intended for teaching purposes. I think messaging can alter this aim." [P19]*
>
> *"I was not aware of the messaging section in the game. Even if I had known about it, I would not have used it." [P2]*

Cultural analysis of societies shows that there is a relationship between communication and culture. Hall (1976) classifies societies as high- and low-context cultures depending on explicit and implicit communication patterns. In Hall's classification, Turkey has a high-context culture. In high-context cultures, oral communication is used more frequently and written

communication is not as common. Therefore, the reason for the unwillingness to communicate by messaging might be related to cultural context, but to explain this situation more clearly, further studies need to be carried out.

Chance

The participants were asked, "How did the random distribution of cards influence you?" to find out about the chance factor, a gamification mechanic. The participants' responses show that they perceived the chance factor positively and thought that context should be considered in the design of this factor:

> *"[Randomization of the cards] might be optional, might be in our hands. Actually, random is better. If it were optional, the person could always select the topics they know well and ignore unknown topics. But, if it is random, the person has to address the topics they do not know. [Thus] they will learn something sooner or later, so that's good." [P28]*
>
> *"More lessons should be provided in the random placement of cards, and the questions should be related to the lesson that we choose." [P8]*
>
> *"For example, there are subjects we do not know, or lessons that we have not taken yet and since we don't know that material, our answers are automatically wrong." [P1]*
>
> *"Since it is a multi-player game, and only the question I have chosen will not be asked, there would not be much difference in the game. I get the chance to learn new information, so it is not a negative aspect for me." [P12]*

The chance factor is a mechanism which is used in promoting the gamification process and makes the gamified processes less boring (Rao, 2016). The findings show that in gamified applications, when designing the chance factor, a different chance factor should be designed and integrated for each context.

Feedback

The participants were asked, "How did the feedback influence your school experience?" to find out about their opinions on the feedback from the gamified mechanics. The first person discourse used in the feedback was found to be positive and effective for measuring performance, and its contribution to participants' motivation was found to be valuable. Two participants stated that the feedback did not contribute to their motivation.

> *"I guess these are the sentences our teacher prepared himself. Very nice sentences. Suitable for student." [P28]*
>
> *"The feedback is a nice way to measure performance in the game." [P20]*
>
> *"The feedback at the end of the game is nice. When I rank the first, I am motivated by that feedback." [P8]*

In gamified e-learning applications, the feedback mechanism is a significant component. Through feedback, the participants have the opportunity to evaluate themselves and progress in the game (Muntean, 2011). In gamified applications, instant feedback influences success and unlike real life, the gamification process can be made a more sustainable experience by giving positive feedback (Groh, 2012).

Constraints

Constraints are the limits of the participants' freedom. In the SoruKüp application, the constraint dynamic is provided by the question cards. To find out about the participants' opinions on this topic, the question, "How did the game's question card structure influence your game experience?" was asked. The participants in general found the question card-based design positive. One of the findings of the interviews was the need to offer the participants more freedom to choose. In other words, the participants' limitation should be related, and they expressed the need to individualize their learning processes by stretching the constraints. Another suggestion was to enrich the content and options in the question card structure. The participants said that rather than having the constraints at a minimum level, more enriched processes might be more meaningful.

> *"As I said before, there are not many questions from my own cards. For instance, in the same topic there may be questions from the first or second term, or from the first or second year. A card from the same category arises twice in the first or second term or year. We should be able to choose the cards. Or if we choose our department before the game, it would be more advantageous." [P19]*
>
> *"I choose cards related to my department, but the question number and departments should be increased." [P26]*
>
> *"The question card structure is pretty good. The period is short I guess, maybe the period for that question might be increased because you need to read quickly and answer. Sometimes you can click on the wrong option." [P28]*

> *"As for the question cards, there were many questions from other courses not related to my own course. The random distribution of the cards is nice, but as there aren't many courses. The few questions related to my topic is a weakness." [P20]*

The individualization of the learning processes influences motivation positively (Riding & Rayner, 1995). One of the aims of gamification is to increase motivation. Therefore, increasing the options of individualization by offering more options in gamified contexts could increase the effectiveness of the gamification application.

Relationships

Another question was the extent to which the multi-player structure design in the SoruKüp application influenced the participants' relationships and motivation. To find out about the participants' experiences, the participants were asked, "How did the multi-player structure influence your game experience?" The multi-player structure increased competitive feelings among the participants, making the players want to be more successful in this competition:

> *"The multi-player structure influenced the competition positively because you can measure your knowledge in comparison to a lot of people." [P20]*
>
> *"You can test yourself. You get more passive if you play it alone, but you can also see others' performance in addition to yours. You can compare yourself with others. It affected my motivation positively." [P12]*
>
> *"It increases personal attention. You need to pay attention to others' responses, and this becomes the driving force, I mean the desire to be more successful." [P28]*

The multi-player structure of the SoruKüp application was designed to have bot users keep participation constantly active. The participants' responses to this were of two types. They preferred real participants rather than bots in order to experience the feeling of real competition. While there were some arguments in favor of the use of bots to increase the game's functionality, some participants suggested that the bots should be designed more realistically in a competitive environment. The participants stated that sometimes it is not possible to win against the bots, which influenced their motivation negatively:

> *"In the multi-player structure, competing with real people rather than bots makes me try harder." [P6]*
>
> *"Competing with others in the game positively influenced my motivation. Competing with real people rather than computers is more competitive." [P2]*
>
> *"The multi-player structure increased competition and influenced motivation positively. I liked competing with the other players. The use of bots reduced the time to start a new game, so it's nice." [P11]*
>
> *"The multi-player structure is nice, but the bot issue is really annoying. They answer instantly, within a second, and it is impossible to win against them after they give the right answer. That is a little annoying." [P19]*

Human-machine interaction is considered to be an important factor in learning processes due the increased capacity of today's information and communication technologies (Latour, 2005). According to connectivism, which is regarded as the digital age's learning theory, learning is not solely a biological process (Siemens, 2004). Thus, the use of bots in gamified learning applications has a rich potential in future studies. As the participants' responses show, bot design can influence learners' perceptions and the success of gamified processes.

Conclusion and Suggestions

In this study, a gamified web-based quiz application was examined in a qualitative case study. Distance learners' opinions were gathered on how it influences their motivation and user opinions on dynamics, mechanics, and components used in the web-based quiz application.

According to research findings, students in a distance education system stated that the gamified application influenced their motivation positively in the learning process. The leader board, a gamification component, enabled them to evaluate their level and see other participants on the board, which increased their perception of social presence. Qualities such as points, achievement and progress supported their learning experiences and made the learning experience a sustainable process. The participants found the social graph component that enabled communication with other participants unnecessary, and some of them stated that they were not even aware of this feature. Some of the participants mentioned that they were disturbed by the potential contact with participants they did not know in person. The negative opinions related to the social graph component could be related to the cultural context, which

implies that presenting this gamification element as an option would result in a more effective gamification design.

The participants thought that it was necessary to give the user the option to choose in chance factor design. There were positive feedbacks on the feedback mechanism, and the participants stated that they had the opportunity to evaluate themselves through the feedback mechanism, which influenced their motivation in a positive way. Another theme was that the first person discourse used in the feedback maintained warm communication.

The participants also mentioned that the features presented in the context of constraints should be more flexible, and if possible, individualized. With regard to relationships, the multi-player structure was found to be positive. This dynamic reinforced competition and increased the learners' participation. One interesting idea that was discovered concerned the use of bot users in distance learning processes. Although some participants preferred real users to bot users, there was positive feedback on the use of bots, and the need for more realistic bot designs was expressed.

The data obtained suggest these recommendations for future research:

- Further studies on gamified learning applications and processes should focus on cultural differences for better gamification design
- The gamification elements can easily be designed and integrated with online environments. Therefore, the use of learning analytics in gamified applications, platforms and similar online contexts could provide information on what type of dynamics, mechanics and components are effective and yield data based on real-time monitoring. Further studies need to be carried out on the effectiveness of gamification elements based on learning analytics.
- The research findings of this study suggest that the use of bots has a high potential in distance education, specifically in gamified learning processes, making the development of bots beneficial for the use of gamification and learning processes. Design-centered research is recommended for future studies.
- This study used the qualitative method of case study to gather learners' opinions and analyze them in detail. To contribute to the relevant literature and to verify the

hypothesis that gamification increases motivation in distance learning processes, more qualitative studies are needed.

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