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***This article is derived from a PhD thesis entitled The Effect of Using Gamification Elements in Online Learning Environments on Students' Academic Achievement, Cognitive Load Levels, Online Learning Attitudes and Motivations*

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An Adaptable Gamification Design in Online Education Based on the D6 Gamification Model

ABSTRACT

The aim of this study is to present an adaptive gamification design in online education using the D6 gamification model and to guide researchers and gamification designers in the decision mechanisms that can be used in the gamification process of online systems. The study utilized a design-based research approach by using two iterative cycles during the development of the system. The initial gamification design was developed with the help of existing literature, and then this design was evaluated by a team of 14 people consisting of two software engineers, four educational sciences specialists, one graphic designer, one front end developer, two gamification specialists and four educational technologists selected by purposive sampling method. The design was also applied to a group of 14 female and 20 male students using the system. These students interacted with the system for two weeks and provided feedback in two one-week cycles. At the end of the two-week period, feedback from both experts and students showed that the usability of gamification can be maximized by improving and diversifying the content, increasing interaction, using reward mechanisms correctly, adapting the content for different age groups, including elements such as excitement and progression, encouraging participation with bonus points, balancing points with badges, ranking levels, using sound and time correctly, and designing a user-friendly interface.

Keywords: Gamification, online Learning, design-based research, web based gamification system

Introduction

Gamification involves integrating game design elements such as points, badges, and leaderboards into non-game contexts to increase user engagement and motivation (Woodcock & Johnson, 2017; Largo et al., 2016). These practices aim to create a more fun and immersive experience and ultimately change user behavior and attitudes (Largo et al., 2016). However, the fact that gamification offers the same solutions to everyone is seen as a shortcoming as it may not yield the desired successful results. Students' different preferences or different reactions to the same game is a critical issue that needs to be considered before designing gamification (Antonaci et al., 2019). Adaptive gamification designs offer a solution to this problem with their flexible design features (Böckle et al., 2018). Adaptive gamification takes into account the principles of adaptive learning (Peng et al., 2019), which aims to create a flexible and data-driven personal learning experience that does not follow a single teaching path. Gamification is seen as a promising application with many features in online education as well as in various educational environments (Othman et al., 2023). Online education is one of the most popular forms of distance education where teachers and students can be in different environments. With the many features it provides, it increases the tendency of educational institutions in various countries to transform their face-to-face education into online education (Sadiku et al., 2018). However, this increasing interest in online education has also brought challenges such as student engagement and low motivation (Şahin et al., 2017).

Gamification applications have attracted great interest from educators because they reduce these challenges by increasing student engagement and motivation in online

environments. Numerous studies have investigated the integration of gamification into online learning environments and demonstrated its impact on student interaction, satisfaction, knowledge construction, and engagement (Doumanis et al., 2019; Jitsupa et al., 2022; Shareef & Rauf, 2022; Tsay et al., 2018;). The importance of gamification in online education is better understood with the challenges posed by the COVID-19 pandemic, which has forced a transition to online teaching and learning. This transition has highlighted the need to redefine the presence of the teacher and learning activities in online university teaching, thus underlining the importance of adaptive gamification systems. Furthermore, the implementation of gamification has been associated with addressing issues such as college dropout rates and lack of engagement, especially in massive open online courses (MOOCs) (Klemke et al., 2020). The potential of gamification to increase students' motivation and engagement in online courses has been recognized across various disciplines, including computer science, psychology, and education (Aries et al., 2020; Imran, 2022). Moreover, the application of gamification in online learning has been linked to the development of 21st century skills and sustainable learning (Mårell-Olsson, 2021). In addition, the adaptive nature of gamification in online education creates the capacity to provide a personalized experience for different learner profiles and increases the attractiveness of e-learning platforms (Rebelo & Isaias, 2020). It is known that the positive impact of gamification in applied systems is related to the specific context, user motivation and individual user characteristics in these systems. In this context, it is very important to plan the gamification design construct correctly, which guides the content, user characteristics, activities and tools to be used (Morschheuser et al., 2017).

The widespread use of online environments has made it compulsory for teachers to be equipped in this regard. Actively using online environments involves simple updates with innovative approaches such as gamification to reduce the difficulties experienced by teachers in online environments (Firwana et al., 2021). Designing and integrating gamification systems into the teaching environment is recognized as an activity that can be performed not only by educators but also by students (Li, 2019). However, the lack of gamification design and implementation results in the failure of many gamification efforts. Accordingly, it is very important to determine the gamification design framework and use the right steps before developing gamification applications (Morschheuser et al., 2017). In addition, even if the right design is used in gamification applications, applications designed only for their own target audience do not appeal to students from different languages and cultures (Yamani, 2021). The gamification systems that instructors will develop specifically for their students will further emphasize the motivation, engagement and academic achievement-enhancing features of gamification (Koivisto & Hamari, 2014). Although there are many studies and model proposals in the literature on the theoretical framework of gamification and its impact on learning (Çağlar & Kocadere, 2015; Kaya & Alpan, 2020; Şenocak & Bozkurt, 2020), the number of adaptive online gamification systems developed using gamification theoretical design models is limited (Yamani, 2021).

The aim of this study is to present an adaptive gamification design in online education using the D6 gamification model with its stages and to help researchers and gamification designers in the decision mechanisms that can be used in the gamification process of online systems. The most important feature that distinguishes this research from other studies is that it is a guide that shows educators how to develop a gamification design from beginning to end and a sample gamification system was developed as a result of the research. In this respect, it will contribute to the literature by shedding light on gamification design processes and constituting a sample gamification software.

D6 Gamification Model

In order to successfully implement gamification practices, it is essential to meticulously plan gamification designs step by step (Kapp & Cone, 2012). One of the widely known gamification design models is the D6 design model developed by Werbach and Hunter (2012), which emphasizes systematic gamification planning. This model consists of six design steps. Named after the initials of each of the six design steps starting with “d” (Taşkın, 2020), all stages of this model are intricately linked to motivation theories (Erümit & Karakuş, 2015). The D6 gamification model is widely used in the literature and guides the implementation of successful gamification practices (Şimşek, 2021). The symbolic design of this model is shown in Figure 1.

Figure 1.
D6 Gamification Model

The first phase of the D6 gamification model involves defining the tasks and operations to be carried out. The next two phases involve the identification of the expected player outcomes from the gamification implementation and the identification of behaviors and active participants within the gamification framework (Bartle, 1996). The fourth stage entails the strategic planning of the activity cycles within the gamification process, which includes determining the amount and duration of the cycles as well as defining the feedback mechanisms. The fifth stage emphasizes the important role of entertainment in the gamification process by integrating the element of fun. The final stage is the process of incorporating game dynamics, mechanics and gamification components within the use of appropriate tools. The compatibility of gamification design with the specific context and target audience and the meticulous planning and execution of each stage of the design are directly related to the success of gamification activities (Hamari et al., 2014; Kapp & Cone, 2012; Kovisto & Hamari, 2014).

Methods

Research Design

This study aimed to develop a web-based gamification system for students studying in higher education institutions. In this direction, a design-based research design was used in accordance with the purpose of the study. Design-based research (DBR) emerged in response to the need to systematically examine theoretically grounded educational designs and to advance the integration of design, theory and practice (Collins et al., 2004).

DBR is characterized as an interdisciplinary mixed methods approach. DBR has great potential for the advancement of e-learning environments due to its capacity to facilitate collaboration between individuals from different disciplines and areas of expertise and its flexibility to use a variety of research methodologies tailored to their specific goals. Scholarly reviews conducted by researchers adopting DBR methodologies unquestionably demonstrate the valuable contributions of this research approach to the field of learning (Barab & Squire, 2004; Sandoval & Bell, 2004;). DBR facilitates the harmonious integration of theoretical inquiry and educational practice. This research method serves to operationalize pedagogical theories and illuminate the interplay between educational theory, instructional design and practical application. At the same time, the use of this research method is crucial in revealing the limitations of alternative research methodologies. The primary aim of DBR is to establish robust links between educational inquiry and practical realities, thereby increasing the relevance and impact of educational research (Kuzu et al., 2011). There are possible steps in the process of conducting DBR. As research processes can vary considerably depending on specific contextual factors, the steps in these studies are not as clearly defined as in quantitative research. However, in broad terms, the prescribed course of action is as follows: Initially, the designer formulates and implements the design. Then, the designer evaluates the practical functionality of the design. After assimilating the insights gained from practical implementation, the designer continuously evaluates the design and makes necessary changes. Over time, the design evolves towards a state of robustness characterized by freedom from errors and maximum efficiency (Kuzu et al., 2011). After these processes, the report of the design-based research is created. The possible process steps to be used in design-based research are shown in Figure 2.

Figure 2.
Design-Based Research Process Steps

In the present study, the DBR model was carried out by considering the steps in Figure 2.

Study Group

Purposive (judgmental) sampling method, one of the non-random sampling methods, was used to determine the study group. Purposive sampling method is based on the idea that the inclusion of a certain group in the study group will have a positive effect on the study when the objectives of the research are taken into account (Campbell et al., 2020; Kılıç, 2013). The study group was categorized under two categories: field specialists determined in line with the relevant literature and 34 students taking the Open and Distance Learning course. While the field specialist consisted of 14 people, including two software engineers, four educational sciences specialist, one graphic designer and one front end developer, two gamification specialist

and four educational technologists, the students in the study group consisted of 34 people, 14 of whom were female and 20 of whom were male, who were third-year students studying at the Faculty of Education. Within the scope of the purposive sampling method, the students were selected from those who took the Open and Distance Learning course at a university in the Eastern Anatolia Region in the 2021-2022 academic year. The selection of the study group from the students taking the Open and Distance Learning course is based on the idea that there should be no doubt about their technology usage skills. The visual with information about the study group is shown in Figure 3.

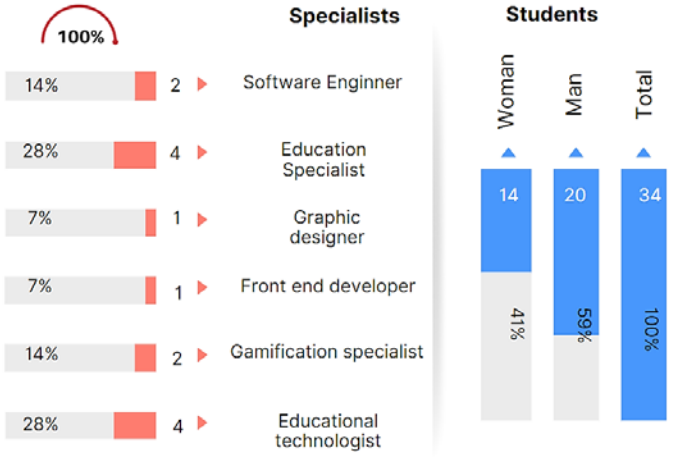

Figure 3.
Information on the Study Group

Design-Based Research Process

In this section, the development stages of the online gamification application from the beginning to the end are included in accordance with design-based research processes. The symbolic design of the research process is given in Figure 4.

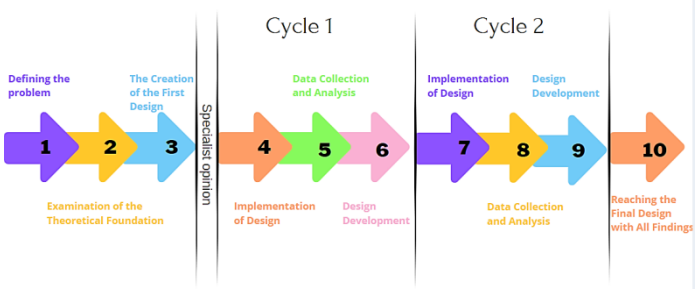

Figure 4.
Symbolic Design of the Research Process

Defining the Problem and Examination the Theoretical Foundation

In order to identify the problem, a detailed literature review process was initiated. Within the scope of the literature review, the difficulties experienced in online environments and the applications that can eliminate these difficulties were emphasized. After the completion of the literature review process, the opinions of four different educational technology specialists specialized in online systems were consulted. As a result of the opinions received and the literature reviewed, it was concluded that students experience various motivational deficiencies in online systems (Ertan & Kocadere, 2022; Gustiani, 2020), they cannot concentrate their attention on the lesson (Cotton et al., 2023), online system design flaws cause cognitive overload (Tuğtekin, 2020), and as a result of all these, they have an inefficient learning experience. To overcome these challenges, the application of gamification has been proposed as a strategy to provide immediate feedback to students in online educational environments (Ertan & Kocadere, 2022). Gamification aims to improve student engagement, motivation and overall perception of online learning platforms by incorporating game elements such as points, badges, leaderboards and rewards into the learning process. Through gamification, students can receive timely feedback on their progress, which allows them to track their performance and make necessary adjustments to their learning strategies. Moreover, the competitive and rewarding aspects of gamified systems attract students' attention and encourage active participation in online learning activities (Bozkurt & Genç-Kumtepe, 2014; Çağlar & Arkün-Kocadere, 2015). For this purpose, it is thought that well-designed gamification activities can offer solutions to negative situations such as lack of learning motivation, negative attitudes towards online learning, cognitive overload and barriers to academic success in online learning environments.

Creation of the First Design

The web-based gamification system was developed for the first two units of the Open and Distance Learning course, "basic concepts of distance education" and "history of distance education", using the infrastructure of wix, a free online web creator. While creating the theoretical structure of the gamification system, the D6 gamification design model was used. While developing the web-based system in accordance with the D6 gamification design, learning objectives were determined in the first step and the behaviors to be acquired as a result of the objectives were decided (Define Objectives / Delineate Target Behaviors). A course syllabus was used to accomplish this. Accordingly, a scenario and a progress guide were prepared and two units that stand out in the acquisition of the target behaviors for the course were added to the gamification system according to the principle of gradualism. The scenario is a guide that clearly states the steps that students will perform when they enter the system and the order of these steps. Through this scenario,

students first created their membership to the gamification site, then completed the first unit games and had the chance to access other games with the game codes they obtained. Then, the players and player types to be included in the system were defined according to the activation of the students in the system (curious, popular, successful, etc.) (Describe Your Players). After the integration of the player types into the system, two different game loops were planned for the two units (Devise Activity Loops), implemented week by week and the basic framework of the gamification system was created by determining the feedback. The game loops designed for two weeks were created using Kahoot, Wordwall and Padlet tools. The fact that these tools include various game elements and can be updated played an important role in their preference. In addition, the ability of these applications to add adaptability to the gamification system was another reason for preference. An example game loop is given in Figure 5.

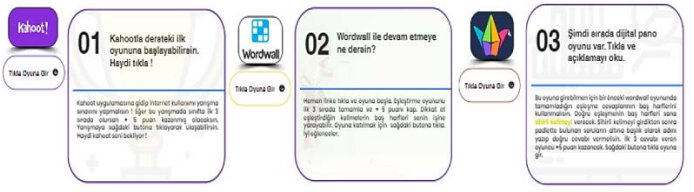

Figure 5.
An Example Game Loop Used in the System

In addition to tools such as Kahoot, Wordwall and Padlet, the DMC (Dynamics, Mechanics, Components) pyramid proposed by Werbach and Hunter (2012) was utilized in designing the system. This pyramid presents game elements in a categorical form and includes the necessary game elements for a system to be a gamification application.
Werbach and Hunter (2012) show the distribution of gamification elements according to the software such as Kahoot, Wordwall, Padlet, which enable the gamification elements to be included in the system externally, and the special design of the website itself in Table 1.

When Table 1 is examined, it is seen that the game elements that should be used in order for the system to be suitable for gamification are fully used both with external software and with the uniquely designed website. In addition, the entertainment factor, which is used in the gamification system and is an indispensable element of games, was included in the system with various multimedia tools (Don't Forget the Fun). Finally, the necessary controls were provided to ensure that the mechanics, dynamics and components of the games (scenario, progression, competition, relationships, challenge, feedback, avatar, badge, leaderboard, etc.) are fully in the system (Deploy the Appropriate Tools).

Table 1.
Werbach and Hunter's (2012) Use of Gamification Elements

		Kahoot	Wordwall	Padlet	Website
Dynamic	Restrictions			x	x
	Emotions	x	x		x
	Story				x
	Progress			x	x
	Relationships	x			x
Mechanic	Challenge	x	x		
	Chance	x	x		
	Competition	x	x		
	Cooperation			x	x
	Feedback				x
	Awards				x
	Queue			x	x
	Winning situation	x	x		x
Component	Successes	x	x		x
	Avatars				x
	Badges				x
	War/Conflict				x
	Leaderboard	x	x		x
	Levels				x
	Points	x	x		x
	Duties				x

Specialist Opinion
After the initial design was completed, the ideas and support of specialists in the field were obtained. In this context, the researcher conducted interviews with 14 specialist, including two software engineers for using the right content, determining the goals and target behaviors and coding the web-based system, four educational sciences specialist for using the right pedagogical approach in the system, a graphic designer and an Front end developer for the visual design of the website, and two gamification specialist and four educational technologists for planning the system in accordance with gamification. The interviews were conducted online and face-to-face (40-60 minutes). In line with the ideas obtained from these interviews, various updates were made to the web-based gamification system.

Design Implementation
After the initial design was presented, the web-based gamification system was applied to the topics under the title of "basic concepts of distance education" in the *Open and Distance Learning course* in one course week. As soon as the students joined the system, they were scored according to their fast registration, the active time they spent in the system and the game loops created with kahoot, wordwall and padlet applications. This game loop

initially included a quiz (kahoot), then a matching application (wordwall) and then a collaborative answer chain (padlet). After the game loop, the web-based gamification system provided students with feedback and a leaderboard. After the implementation, the interview form, which was used as a data collection tool, was applied to the students online and data about the implementation were collected. In line with the data obtained, some improvements were made to the web-based gamification system and the first cycle was completed. Then, the web-based gamification system was updated in line with the results of the first cycle. The current design was applied to the students again with the subject content of "history of distance education", which is another course week. Then, interviews were conducted with the students again and data were collected for the application. In line with the data obtained, the web-based gamification system was updated again and the second cycle was completed. Finally, the final design of the web-based gamification system was obtained by taking into account the data obtained and the interviews with the specialists.

Data Collection Tool

In the study, unstructured interview forms were used to obtain the opinions of field experts and students. Unstructured interviewing is a qualitative research method that allows for open-ended, flexible questioning and allows the interviewee to freely express their thoughts and experiences. This approach does not impose a predetermined set of questions, allowing for a more natural flow of conversation and the exploration of unexpected avenues of inquiry. Unstructured interviews are particularly useful in exploratory research as they provide a rich source of detailed, in-depth information and insight into the interviewee's perspectives and experiences (Osborne & Grant-Smith, 2021). Interviews were conducted with gamification experts and then with students using gamification applications and data were collected through unstructured forms.

In addition, before data collection, an ethics committee report was obtained with the decision of Fırat University Social and Human Sciences Research Board dated 04.11.2021 and numbered 7. All participants in this study participated voluntarily and completed a consent form.

Data Analyses

Content analysis was used to analyze the data obtained through interview forms. The main purpose of content analysis is to explain the data obtained in meaningful relationships, conceptualize them, organize them logically as a result of the emerging concepts and turn them into themes (Yıldırım & Şimşek, 2016). Content analysis aims to analyze the data, to gather similar data under the umbrella of certain concepts and to enable the reader to understand the truth hidden in the data (Büyüköztürk et al., 2012). For this purpose, the data collected with the interview forms were read in detail and the first coding process was carried out. With the first coding process, the categories that the codes can form were determined. After this process, a certain period of time was waited and the relationship between the codes and the categories was reviewed again and some minor changes were made. In the last stage, the findings obtained were defined. In addition, in order to ensure reliability, the researcher provided detailed and realistic information as well as complete and direct quotations from the participants (Büyüköztürk et al., 2012; Dinç, 2015). The quoted information was presented in italic font, with the first part indicating the data source (U=Expert Opinion / Ö=student opinion), the second part indicating gender (K=female / E=male), and the third part indicating the student rank / field of specialization as (Ö-E1) or (U-SE). In addition, two researchers took part in the data analysis and the reliability formula of Miles and Huberman (1994) was used to ensure internal consistency. As a result of the reliability formula calculations, 90% reliability level was reached. This figure, which expresses the consensus between the coders, should be at least 80% (Miles & Huberman, 1994).

Results

The research findings are presented in accordance with the design-based research approach, using cycles to describe the developmental progression of the web-based gamification system together with expert judgment and the user experience at each stage, in line with the data obtained from the students.

Table 2.
Findings from Experts and Students

Category	Code	Software Engineer (SE)	Education Specialist (ES)	Graphic Designer and Frontend developer (UX)	Gamification Specialist (GS)	Education Technologist (ET)	Cycle 1	Cycle 2
Deficiency	Content	x					x	
	Interaction	x						
	Time restriction				x			
	Reports menu				x			x
	Bonus points				x		x	
	Audio usage					x		
	Simple design			x				
	Technical infrastructure						x	
Suitability	Reward-time		x					
	Content - Age		x					x
	Group - Interest		x					
	Icon design style			x				
	Color and color transition			x				
	Points - Level				x			
	Badge - Points				x			
	Implementation Duration					x	x	
	Application Environment					x		

Expert and student opinions on the web-based gamification system are presented in two categories as deficiency and suitability. While the codes under the deficiency category express some features that are seen as missing in the web-based gamification system, the codes under the suitability category express suggestions regarding the suitability of some parameters in the web-based gamification system. A software engineer (U-SE) who thought that the content was missing in reflecting the Access to Information on the Web course stated the following: "*It may be a correct approach to divide the course into six basic units, but the content needs to be enriched*" and requested that the theoretical knowledge in the system be increased. Another software engineer (U-SE) who provided an opinion on increasing student interaction emphasized increasing interaction in the system by saying, "*A social sharing plugin can be added to the site in order to increase student-student and instructor-student interaction in this web-based system. Interaction tools such as comments, likes and following make the system more dynamic*." An education expert (U-ES) commenting on the awards and the time they are given said, "*In order to ensure that the desired behavior occurs, awards should be given immediately after the behavior is performed. At the same time, the frequency period of the rewards given is also important. In this respect, the system needs some updates,*" he said, and made suggestions for the reward-time balance in the system. Another education Specialist (U-ES) emphasized that certain points of the games should be arranged according to the upper age groups with the words, "*Some content may appeal to lower age groups. This creates a problem in terms of the users' interests in the correct gamification planning. Some games need to be updated according to age.*"

A gamification specialist (U-GS), who thought that the system was suitable for gamification applications in many ways, said, "*There must be a time limit in the game cycles and the cycles must be in a gradual relationship with each other. This makes the games more exciting. In addition, a feedback page should be created in order to follow the progress of the students,*" and supported the suggestions regarding the feedback page put forward in the second cycle. Another gamification specialist (U-GS) said, "*Extra points can be encouraging in order to eliminate the demotivating effect of gamification and to provide new opportunities for students who fall behind in the leaderboard,*" and ensured that extra points could be obtained within the scope of the achievements demonstrated in the game cycles. This opinion was also expressed in the first cycle after the first application. Another gamification specialist (U-GS) suggested a harmony in terms of points, badges and levels with the statements, "*The points obtained from the badges should be related to the action performed. Similarly, the points should be distributed in a balanced way in terms of accessibility to the levels.*" An educational technologist (U-ET) who examined the system in detail said, "*Some sounds appropriate to the emotions should be added to the game cycles in gamification. If these sounds are planned in a way that can express losing, winning and competition, gamification will be more effective.*" Another educational

technologist (U-ET) emphasized duration and environment with the words, "*The duration of some planned applications should be appropriate to the application to be implemented and the educational technology tool used,*" and stated that extending the duration of the games could lead to other problems. A graphic designer (U-UX), who suggested that the design be designed with a certain harmony and simplicity, said, "*It is important for the designs used to represent the menu icons and badge to belong to the same design language in terms of integrity and provides simplicity,*" and supported the interface designer who suggested simplicity in colors and color transitions.

After the first design was applied for a week, a student (Ö-E11) stated that the content should be enriched during the first cycle by saying, *"When you compare the content with the course, it seems like a few more games could be added."* Another student (Ö-E12) said, "*Sometimes the leaderboard can be demotivating*" and emphasized the need for bonus points for students who are at the bottom of the leaderboard. A student (Ö-K5) who focused on technical deficiencies said, "*Since it was applied in online courses, sometimes problems caused by the internet could cause our points to decrease in the games."* Another student (Ö-K13) who emphasized the application times of the games said, "*Since gamification applications are applied through technology, the addictive effect of the game caused me to be more involved with technology. Therefore, I can say that I experienced some physical difficulties.*"

The gamification system was updated in line with the findings of the first cycle. Then, the system was implemented for a week in the second cycle. After the implementation, one student (Ö-E6) emphasized the content-age compatibility by saying, *"Some games were designed for lower age groups, which made us bored while using them."* Another student (Ö-K9) emphasized that the reports page should be improved by saying, *"If the details of the reports could be shared on the page created for tracking the results, our mistakes could be seen more clearly."*

Reaching the Final Form of the Design

While developing the web-based gamification system, it was filtered in four different stages: literature review, expert opinion, first cycle (student opinions) and second cycle (student opinions). The design reached its final form in line with the findings obtained at the end of these four stages. The visual for the home page of the web-based gamification system is given in Figure 6.

Figure 6.
Web Based Gamification System Home Page

The developed gamification system consists of six sections: levels, awards, leaderboard, gamebook, avatars and reports. Students were held responsible for both the information in the two basic units on the system (basic concepts of distance education, history of distance education) and some activities they will perform in the gamification system. The students who achieved the highest score in each activity cycle for which they were held responsible were shared on the system's home page under the name "unit stars". All activities of the students on the gamification system and the levels and progress they will achieve as a result of these activities were presented to the students under the "levels" main menu. The visual related to the levels menu is given in Figure 7.

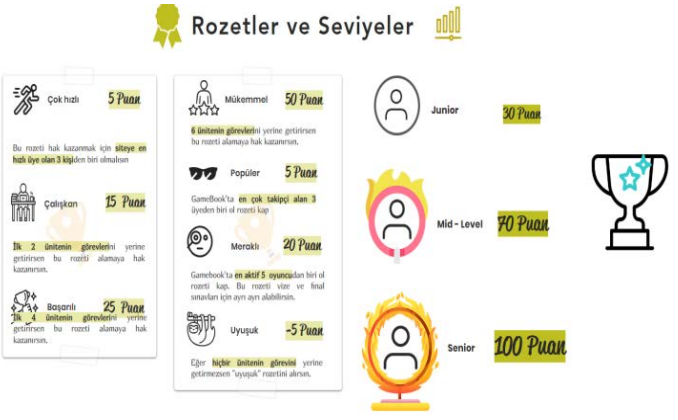

Figure 7.
Badges and Levels Used in the Gamification System

The designed gamification system assigned various badges to students' activities within a scenario, and these badges, which earned students certain points, assigned students to planned levels and provided feedback through the system. Badges and levels were explained to students in detail during the introduction of the system. After the introduction, the student who registered to the system the fastest was given a "very fast" badge and five points. Students who completed the games for one-fourth, half or all of the two basic units that make up the system were

given a “hardworking” badge and earned 15 points, a “successful” badge and earned 25 points, or a “perfect” badge and earned 50 points, respectively. In addition, a social sharing page called “gamebook” was designed in order to ensure relationship and cooperation, which are among the gamification mechanics and dynamics. While the most active player on this page was given 20 points with the “curious” badge for the shares he made, the player who gained the most followers was given a “popular” badge and earned 5 points. The visual of the gamebook social sharing page used in the gamification system is given in Figure 8.

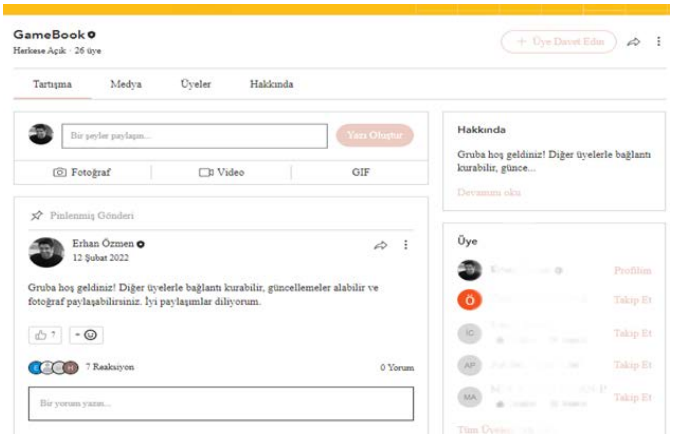

Figure 8.
Social Sharing Used in the Gamification System

Students were assigned as “Junior” (30 points), “Mid-Level” (70 points) and “Senior” (100 points) in the system with the points they obtained thanks to these badges and were entitled to receive certain points. In addition to the points they received from the badges, students were provided with extra points that they could earn according to the activities they performed in the game flow of the two units and added to their student points by the system. Explanations regarding the extra points were given to students under the name of the “awards” menu. The visual of the awards menu is given in Figure 9.

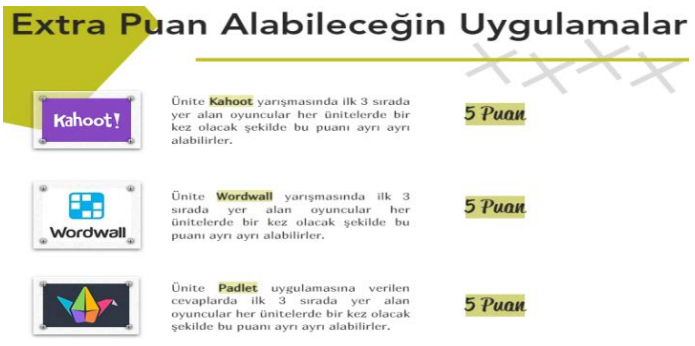

Figure 9.
Extra Rewards That Earn Points in the Gamification System

In addition, the necessary information regarding the points and levels earned by the students was calculated with the leaderboard in the web-based gamification system and shared with the students via the “leaderboard” page. The visual for the leaderboard menu is given in Figure 10 below.

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Figure 10.
Leaderboard and Scores in the Gamification System

Students immediately determined their own avatars after becoming members of the gamification system and reached certain levels in the system by collecting points through the badges assigned to their avatars with the activities they performed. Avatars serve as an important component in gamification designs. In this context, a page was designed in the web-based gamification system where students can control their own avatars, the badges they received, the points they received, and the number of followers using the avatars menu. The visual of the avatars menu is given in Figure 11.

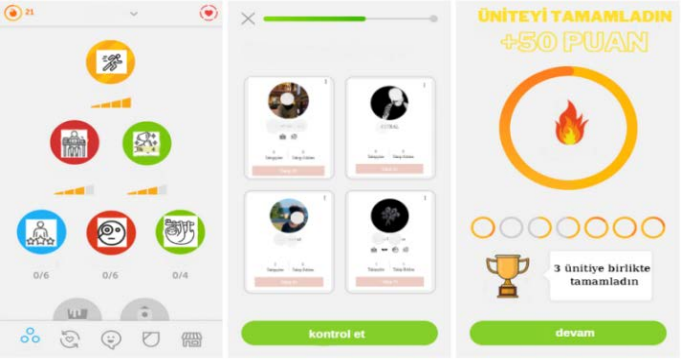

Figure 11.
Page Showing Avatars, Badges and Followers in the Gamification System

While developing the gamification system, feedback was used to enable students to remain more active in the system throughout the process. The results of the Kahoot,

Wordwall and Padlet applications used in the game cycles in the two basic units were given to students on a weekly basis, and the scoring used in the gamification system was transparently transferred to students. Feedback from gamification dynamics undertook functions such as students tracking their success, evaluating themselves and acquiring new learning methods, and increasing course loyalty. The feedback used in the web-based gamification system was presented to students periodically using graphics and visuals under the Reports main menu. The visual of the Reports main menu is given in Figure 12.

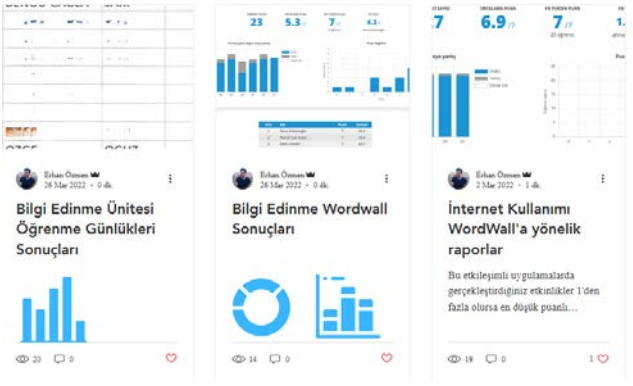

Figure 12.
Screenshot of the Reports Home Page in the Gamification System

Discussion

Within the scope of the current research, the opinions of specialists and students provide some perspectives on various aspects of a web-based gamification system. Software engineers contributing to the research emphasize the importance of content enrichment to support theoretical knowledge and increase student engagement through the integration of social interaction tools. In parallel, some studies in the literature have revealed the positive effects of gamification content enrichment on engagement and motivation (Alsadoon, 2023; Alsawaier, 2018; Aprilia et al., 2023). Within the scope of this research, education specialists underline that timely rewards, age-appropriate content, and establishing a consistent group-interest relationship are essential to maintain user interest and motivation. In line with the current research findings, Aguiar et al. (2019) described the constructive effects of correctly structuring the reward-time relationship on interest and motivation, while Seaborn and Fels (2015) emphasized the importance of using age-appropriate content in the field of gamification. In addition, various studies have shown that gamification groups can benefit from gamification applications in parallel with their interests and cannot create motivation for designs they are not interested in (Tunga & İnceoğlu, 2016; Vilarinho et al., 2018).

Gamification in interface design involves integrating game design principles and methods to improve user engagement and behavioral intention towards information systems and information technology (Cheng, 2021). Although gamification has the potential to increase user experience and motivation, careful evaluation of design elements is essential to prevent a decrease in usability (Johnson et al., 2016). Elements such as game mechanisms, frameworks and specific interface designs play a critical role in influencing user behavior (Cheng, 2021). In this direction, in the current design study, front end developer and graphic designers advocate simplicity, unity and harmony in design creation, emphasizing the critical importance of simplicity and design integrity in keeping the user experience at a high level and achieving the desired results (Torun & Tatar, 2023).

In the developed gamification model, gamification specialists emphasized the importance of including time constraints, feedback mechanisms, and bonus points in gamification to increase participation. Supporting specialist opinions, various studies reveal that time pressure (Aparício et al., 2019) and feedback provide high participation. Similarly, Deterding et al. (2011) suggest that time constraints in gamified games create a sense of scarcity and motivate participation through a perceived urgent need. However, in the current study, the need for feedback in gamification was emphasized in line with the opinions of gamification specialists and students in the second cycle. In line with the current study, it is observed that feedback in gamification applications plays an important role in improving learning outcomes (Qi, 2023), increasing motivation and performance, encouraging deep thinking (Berger et al., 2023), and creating a sense of progress and achievement (Hassan et al., 2019; Sadovets et al., 2022). In addition, the specialist who participated in the study suggested a page that allows students to follow gamification applications as a feedback source. Gürsoy and Göksün (2019) mention that similar page designs can be a common strategy for improving user experience and underline the importance of feedback pages.

In the current study, the inclusion of additional points in gamification was identified as an important factor in increasing student motivation. This result is supported by various studies that reveal the positive effect of providing additional points on student motivation (Sezgin et al., 2018) and engagement (Yüksel & Canlı, 2019). However, in the study, gamification specialist recommended a comprehensive approach that integrates elements such as points, badges, and levels to develop successful gamification applications. Research has indicated that

points, badges, and leaderboards are among the most common gamification elements used in various applications, and these elements contribute to the success of gamified applications when blended with gamification features such as quizzes, rewards, and feedback (Mat & Rahman, 2020). In the current study, educational technologists emphasize the importance of including appropriate sensory elements in game loops to create immersive learning experiences. In parallel with this finding, Matthew et al. (2022) stated that multimedia tools facilitate curriculum presentations and interactive participations required for gamification applications and underlined that elements such as audio-video are brought together in gamification to provide immersive and engaging experiences for users. The findings obtained from the study emphasized the importance of eliminating technical deficiencies in the gamification system, using age-appropriate content and bonus points. In parallel with this perspective, Tunga and İnceoğlu (2016) stated that gamification should be age-appropriate for the target audience, while Attali and Arieli-Attali (2015) revealed that the points used in gamification ensure that students develop a positive attitude towards the course and positively affect the speed of their responses to the tests. When it comes to a general evaluation, it is seen that the opinions of the specialist and students participating in the study provide a perspective compatible with the literature.

Conclusion and Recommendations

In this direction, the following suggestions are offered to gamification designers in the light of the findings and results obtained.

1. Address the need to enhance content and diversify it to appeal to a variety of age demographics to better align with the course curriculum. This may include updating games and activities to ensure that all users are engaged and relevant.
2. Interactive tools such as social sharing plugins, comments, likes, and follows can be implemented to increase interaction between students and between students and instructors. This can create a more dynamic and engaging learning environment.
3. Ensure that rewards are given immediately after desired behaviors to reinforce positive actions. Frequency of rewards should be adjusted to maintain motivation and engagement levels. Balancing the reward-time ratio can be helpful in maintaining user interest.
4. Content that appeals to a variety of age groups should be revised to ensure it is aligned with the target audience. Age and gamification design compatibility can be critical to success.
5. Time constraints should be added to game loops to add excitement and progression. A detailed feedback page should be developed to allow students to track their progress and receive constructive feedback on their performance.
6. Extra points should be offered as incentives to motivate students and eliminate demotivating effects. Continuous participation and progress can be encouraged by ensuring that extra points are available for achievements in game cycles.
7. A balanced relationship should be established between points, badges, and levels to ensure consistency and accessibility. The overall gamification experience can be improved by linking points obtained from badges to specific actions performed.
8. Appropriate sounds reflecting emotions such as winning, losing, and competing should be included in the gamification system to enhance the immersive experience. It should be ensured that the duration of the game applications is compatible with the educational technology tools used to prevent potential problems and maximize user engagement.
9. The interface should be designed with simplicity and consistency by ensuring that menu icons and badge designs adhere to the same design language in terms of integrity and user-friendliness. Consistency should be maintained in color schemes and transitions for a visually appealing and intuitive user experience.

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Informed Consent: All participants in this study participated voluntarily and completed a consent form.

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