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A Novel Turkish Learning Environment for Foreign Primary School Students: The educational digital game "Journey to Turkish"*†

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SUMMARY

The present study aimed to discuss the development of an educational digital game for Turkish language instruction as a second language to foreign primary school students. First, the correlation between digital games and education was discussed, the learning and motivational theories fundamental to the educational digital games were investigated, the educational digital game design models and educational digital games in second language instruction were addressed. Finally, the development of the educational digital game "Journey to Turkish", which was based on the spiral educational game design model for the instruction of Turkish language to foreign primary school students, was detailed. The “Journey to Turkish” game was developed in four stages: analysis, design, development-implementation and evaluation; the process was based on the constructivist learning theory and social cognitive learning approach, a cognitive learning theory, flow theory, a motivational theory, and ARCS-V model. The game "Journey to Turkish," a three-dimensional, single player, task-based role-playing game was developed on the Unity 3D platform. The game includes seven stages, each part corresponds to the themes in the Turkish A1 language level. In the game, the player visits seven cities, namely Eskişehir, Çanakkale, Nevşehir, Konya, Adıyaman, İzmir and İstanbul, and collects certain cultural items by completing reading and writing tasks.

Keywords: Educational digital game, Turkish instruction as a second language, spiral educational game design.

INTRODUCTION

Due to its geographical location and the policies on the regional crises, Turkey has been one of the countries most affected by migration. Turkey hosts a significant number of refugees and is also a center of attraction for foreign students, which led to revisions and developments in the education system in Turkey. The field of Turkish language instruction to foreigners has been one of the fields where a significant portion of these developments were observed. Turkish language instruction to foreigner’s programs, books and material, and online platforms and publications have been developed in this process. The review of these developments would reveal that the target audience in the field has been mostly adult students. However, General Directorate of Lifelong Learning data demonstrated that there were 788,641 foreign students registered in the e-school or YÖBİS systems in Turkey, and 377,410 of these students were primary school students (General Directorate of Lifelong Learning, 2020). In other words, most foreign students in Turkey are children. Literature review revealed that the biggest problems experienced by foreign children included language issues; and hence, communication problems, the selection and application of an adequate instructional method, inability to meet the expectations of these students, and problems associated with available the material (Atalay et al., 2022; Güngör & Şenel, 2018; Sarıtaş et al., 2016; Taşkın & Erdemli, 2018; Tunga et al., 2020). Technology could be one of the solutions of these problems. The adoption of student-oriented methods and techniques and adequate technologies is quite important, especially for the success in teaching a language as a foreign or second language to young students (Kara, 2010; Kurt, 2019). Furthermore, it is known that the activities conducted in this field would be accepted to be internationally competitive to the extent that they are assisted by technologies, and technology use would improve the competitiveness of Turkish language instruction among other world languages (Durmuş, 2013). Studies reported that the language skills of students who learn a native, foreign or second language develop better in technology-assisted classrooms (Ghanizadeh et al., 2015; Zhao, 2003). Studies also demonstrated that the technology-assisted language instruction improved learning performance and motivation of the students and provides them more efficient tools in learning a language (Jin, 2018; Shadiev & Huang, 2020). Technology provides several tools for language instruction, which combine technologies and language instruction, leading to novel language learning environments. One of these

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environments could be offered by educational digital games. Studies on educational digital games in language instruction reported that games were functional in the development of basic language skills, learning grammar, the increase in motivation and vocabulary in both second education and foreign language learning (Castillo-Cuesta, 2020; Chen & Yang, 2013; Hung et al., 2018; Liu & Chu, 2010; Suh et al., 2010). Thus, educational digital games have a significant potential used in language instruction due to their properties. However, the number of available educational digital games for the instruction of Turkish as a native, second or foreign language is quite few. Most of the few available games only aim to improve grammar and vocabulary (Uluçay, 2013). Teachers considered digital Turkish language environments inadequate both in quantity and quality (Ertem, 2016). However, the instruction of Turkish language to foreigners has become quite important in recent years, especially due to globalization. However, global developments, migration, the speed and prevalence of transportation and communication activities have increased the demand to learn the Turkish language, clarification of the needs, and diversification of supply instruments (Uzun, 2018). Integration of technologies into second language learning/teaching environment and employment of instructional technologies and materials in these environments could improve the motivation of the students to learn. Right and effective technologies could motivate learning in language instruction (Başal, 2019). Thus, the present study aimed to discuss the development of an educational digital game for Turkish instruction as a second language to foreign primary school students.

Digital games in learning

Currently, the design of several digital games are based on pedagogical principles to address educational issues (Ocak, 2013). These educational digital games, developed to achieve certain learning outcomes while entertaining, aim to achieve certain learning goals (Çetin, 2013). The structure of educational digital games, which combine education, practice and thinking and support self-regulated learning, leads to a motivating and attractive learning experience, paving the way for the employment of digital games in teaching environments (Rieber, et al., 1998). Aksoy (2014) described the educational digital games as those developed to ensure the cognitive and affective development of the learner through technological tools based on educational goals. Educational digital games that include the entertainment and motivational features of computer games could be employed as an alternative, could complement and improve other instructional methods (Çankaya & Karamete, 2008).

Prensky (2001) christened the approach that employed educational digital games in education as "Digital Game-Based Learning" and argued that these environments that combine digital games and education were more fun, interesting and effective when compared to the conventional environments. Digital game-based learning is an approach that employs digital games to instruct learning content based on the transfer of the motivational power of digital games to learning environments to raise learner interest. Prensky (2001) reported that digital game-based learning allows the students to participate in the education voluntarily and effectively, leading to latent learning.

Theoretical framework of educational digital games

Educational digital games are developed based on certain theories. Both learning theories and educational digital games that would be employed in learning environments are significantly based on motivation theories. These games have been based on three learning theories: behaviorist, cognitive and constructivist theories.

The required constructs are planned to allow the individual to exhibit certain behavior in educational digital game environments (Meşe & Dursun, 2017). Digital games allow the player to exhibit certain behavior based on the principles of behaviorist theory. Behavioral learning theories considered learning as a change in behavior and argued that students adjust their behavior based on preset goals behavioral outcomes (Barut, 2012). Similar to the behavioral theory, concepts such as reward, reinforcement and punishment play a key role in educational digital games. It was assumed that the rewards and reinforcements in the games that incorporated the principles of classical and operant conditioning would create a sense of pleasure in the players and they would repeat the desired behavior more frequently in the game (Meşe & Dursun, 2017). Although punishment in educational digital games is a key element to keep the individual flow and excitement, it was argued that the behavior of individuals should be shaped not punished in digital games (Meşe & Dursun, 2017). The cognitive approach, on the other hand, was not based on behavioral responses; it was associated with the knowledge of the learners, the acquisition of that knowledge, and related cognitive processes (Jonassen, 1991). Certain principles of the cognitive approach are employed to design educational digital games and determine their use in learning. For example, the social cognitive approach is a learning theory that focuses on concepts such as observation, modeling and indirect experiences, which argued that individuals learn by observing the actions of other individuals and the outcomes of these actions (Altun & Çolak, 2014). According to the social cognitive learning theory that opposed the view that learning could only achieved through first-hand experiences, learning could also be achieved by observing other individuals' behavior or the outcomes of this behavior (Gültekin, 2012). These cases were explained with the concepts of modeling and learning through observation, and demonstrated that individuals can learn certain behaviors from their avatars or other characters in the game through indirect learning. Furthermore, self-regulation (Senemoğlu, 2012), an important concept in social cognitive learning theory, explained the impact of educational digital game design on learning. In games, individuals observe their own behavior, make a judgment by comparing these

behaviors with self-perceived criteria and the game, and when, adapt their behavior based on these criteria. In learning environments assisted by digital games, learners influence, guide and control self-behavior to spontaneously succeed in the games and achieve learning outcomes. Finally, the constructivist learning theory argued that knowledge is actively constructed through the integration of prior and novel knowledge, cooperation and peer interaction are quite important in this process, and the acquired knowledge could be transferred to other settings and topics. In constructivist learning environments, learners learn by interacting with their environment and peers, and these environments include a trial and error process, and could interpret students' past and present experiences to revise their knowledge (Felicia, 2009). Sir (2013) reported that the goals in educational digital games supported individual problem solving, leading to teacher-learner and learner-learner cooperation. In these gaming environments, students play the game individually to reach the goals at a real developmental level. To reach their potential development level, they can work with their peers or teachers and use the clues, feedback and assistance provided by the game. Thus, educational digital games could contribute to learners' real and potential development levels due to the cognitive assistance they provide. Social constructivist theory principles are frequently used in game development. The digital games, the first levels of which are easier when compared to the other levels, allow the players gradually learn the game mechanics, improve their competence, and learn new skills required for success. These properties of educational digital games help maintain high student motivation and learning (Felicia, 2009). Felicia (2009) reported that educational digital games included constructivist theory components, and players encounter failures, reflect, define, and develop hypotheses on the reasons for failure, plan actions that could help them overcome these problems, test and analyze their hypotheses in games. In other words, individuals play by feeling, doing, watching and thinking and learn by reflection in educational digital games. Thus, it could be argued that educational digital games are based on behavioral, cognitive and constructivist learning theories. These games include all approaches to a degree. However, early educational digital games emphasized behavioral and cognitive theories, while newer digital games reflected the principles of constructivist theories due to their complexity, open-ended and collaborative nature.

Motivational theories and models provide a framework for educators and game designers to investigate the interaction between the players and these games. Motivational theories such as self-determination theory, Malone's motivation model, Fogg behavioral model, flow theory, ARCS-V model, three-layer motivation model, expectation value theory, and goal setting theory have been employed in educational digital games. Self-determination theory explains the impact of the three psychological needs (competence, autonomy, and commitment) on individual's motivation and personality. Competence reflects the motivation of the player to challenge the game conditions and manage related emotions. Autonomy is the player's willingness to fulfill the assigned tasks in the game and self-determination of the player in the game. Commitment, on the other hand, refers to the increase in the motivation of the player by communicating with other players and socializing with them (Fiş Erümit & Karakuş, 2015). In Malone's motivational model, the elements of an activity that motivate individuals should be built on the elements of difficulty, curiosity, control and fantasy (Garris et al., 2002). Difficulty entails the student efforts to complete an assigned learning outcome in the game. Curiosity entails the design of game difficulty based on the student level to maintain interest in the game. Fantasy entails the inclusion of entertaining elements in the game. Control is associated with the development of a structure that would allow the students to choose in the learning environment (Reisoğlu et al., 2015). The Fogg behavior model emphasized three factors: motivation, ability, and triggers. Fogg (2009) argued that an individual should possess adequate motivation, ability and an effective trigger concurrently to acquire a target behavior. According to the model, the motivational elements in the game could motivate talented but unmotivated players. These elements included pleasure/pain, hope/fear, social acceptance/rejection. Ability components were determined as time, money, effort, social deviation, brain cycles and non-routine actions (Fogg, 2009). Fogg (2009) described the triggers as instructions that instruct people to conduct a certain behavior such as commands, cues, and calls to action. Flow theory was developed by Csikszentmihalyi (1975). Csikszentmihalyi (1975) and described flow as an individual's holistic immersion in an experience with all emotions. The individual's entrance into the flow depends on whether the activity is challenging for the individual and the ability of the individual to cope with this challenge (Özkara & Özmen, 2016). Flow occurs when the individual's ability and the level of challenge are equal (Csikszentmihalyi, 2014). When the individual's ability is higher than the challenge in the task, the individual will get bored, and in the opposite case, the individual would give up on the task due to excessive difficulty. For the individual to stay in the flow, the difficulty and complexity of the assigned tasks should be equal to the individual's skills (Csikszentmihalyi, 2014). The ARCS-V model was developed to increase the motivational attractiveness of instructional material and includes strategies and a systematic design (Keller, 1987). The ARCS-V model identifies five criteria that should be met for motivation and sustenance of this motivation: attention, conformity, confidence, satisfaction and willpower (Keller, 2016). In learning environments assisted by educational digital games, individual attention should be maintained based on these principles; goals should be defined clearly, learning goals should be compatible with individual needs, individuals should be satisfied with learning, should know that they overcame the challenge in the game based on their skills, and their will should be balanced to achieve the learning outcomes. The three-layer motivation model has been frequently used in gamification applications; however, it is

a fundamental component of the theoretical background of educational digital games in terms of content and ideas. Marczewski (2015, cited by Meşe & Dursun, 2017) discussed motivation in three layers: basic, affective and entertaining. The basic layer is based on security, health and psychological requirements. The affective layer includes emotional dimensions that affect individual motivation such as the individual's desire for connection with others while remaining autonomous and independent, to improve expertise through the development of skills, and the readiness of the individual to conduct target actions. The entertaining part is associated with gaming features such as badges, points, leaderboards and rewards. The expectation-value theory that aimed to explain the impact of motivation on preferences, permanence and performance assumed that expectations and values directly affect individual preferences, performance, efforts and permanence for success, which are influenced by task-specific beliefs such as skills, perceived difficulty of various tasks, and individual goals (Wigfield & Eccles, 2000). Expectancy value theory includes three variables: effort-performance expectation, performance-outcome instrumentality, and the value of outcomes (Ilgen et al., 1981, cited by Meşe & Dursun, 2017). The effort-performance variable emphasizes the correlation between the effort spent and the performance achieved by the individual. The higher the effort to achieve an outcome, the higher the performance expectation. The second variable, performance-outcome instrumentality, refers to the perceived correlation between individual performance and outcomes, and the reward that comes with the performance. Finally, the value of the outcome reflects the satisfaction of the individual with the accomplished work and the perception about the utility of the outcomes. Meşe and Dursun (2017) explained the reflection of this theory in educational digital games and emphasized that an individual efforts to achieve game goals, collect points, and finish levels in an educational digital game should be rewarded, and argued that as the individual efforts increase, the probability of achieving the goals should increase. Player should be rewarded for achieving the goals, collecting points or finishing the levels, and this outcome should satisfy the player and should enjoy the assigned tasks when completing them. Furthermore, the assigned tasks should be based on player needs in educational digital games to keep the motivation high (Meşe & Dursun, 2017). Finally, according to the goal setting theory developed by Locke, which suggested that individual behavior depends on consciously determined goals, the clarity of the goal, the level of difficulty, and the dedication to achieve the goal motivates the behavior (Yücel & Gülveren, 2011). Goal setting theory argued that when performance targets are both clear and difficult, the highest level of performance will be achieved and clear targets will lead to higher performance when compared to unclear targets (Locke & Latham, 2005). According to this theory, the quality of the goals assigned in educational digital games should be predetermined, the designers should make sure that these goals are difficult but achievable and communicated clearly to the students. Student performance should be evaluated during the game based on the achievement of the goal. During the game, continuous feedback about achievement should be available for the students. A timeframe should be determined for the achievement of the goals in the game, and priority, more difficult or complex tasks, etc. should be scored higher. A system of rewards should be established. Thus, learning and motivation theories in the design of educational digital games and educational content ensure that the game content would maximize the achievements and ensure the most effective presentation of the educational content. Therefore, the design process will be strengthened theoretically and the resulting product will be used efficiently.

Educational digital game design

A game design based on an adequate model leads to better efficiency and speed. Literature review revealed that various design models have been utilized in game design: Digital Game Based Learning-Teaching Model, Effective Learning Environment Model (EFM), FIDGE Model, Experiential Game Model, Game Object Model and Spiral Educational Game Design Model. Digital game-based learning-teaching model employs the game as a tool to instruct the content and combines the game and educational design (Zin et al., 2009). Two main components, namely pedagogy and digital games, and various elements associated with these components are specified by the model. Zin et al. (2009) reported that pedagogy component of the model was based on the learning objective, learning theory, educational psychology, curriculum requirements, patriotism and moral values, and memorization and omission theory. It was reported that various elements should be considered in digital game design such as the story, rules, immersion, entertainment, feedback, multimedia technologies, challenge-competition, and rewards. In the model, the pedagogical and digital game components interact, and the collaboration between the students also plays a key role (Zin et al., 2009). The digital game-based learning-teaching model includes 5 stages: analysis, design, development, quality-control, implementation and evaluation, where each stage includes several steps (Zin et al., 2009). In the effective learning environment model, motivation is increased based on the correlation between flow and the educational game in terms of the ARCS motivation model (Song & Zhang, 2008). In educational games that convey specific goals and preset procedures within a virtual space, students take the stage and are challenged by specific tasks based on their knowledge, skills and tools. In this process, players can receive feedback, regulate their behavior and continue to play due to the incentives. Thus, students learn the presented knowledge and skills without realizing that they are in a learning environment. Thus, in educational games, the probability of active learning is quite high (Song & Zhang, 2008). The FIDGE model, which was based on fuzzy logic, was developed based on real-life data (Kaplan Akıllı & Çağıltay, 2006). In the model, the dominant design approaches, the individuals who should play a role, and the

characteristics of these individuals, the game principles are explained in detail. The FIDGE model includes four stages, pre-analysis, analysis, design-development and evaluation (Kaplan Akıllı & Çağıltay, 2006). These are dynamic stages with fuzzy boundaries that require instructional designers to adopt a non-linear approach. The experiential game model developed by Kiili (2005) was based on experiential learning theory, flow theory and game design. In this model, the main learning objective is to associate gameplay with experiential learning to facilitate the experience of flow. This was described as the construction of cognitive structures in a cyclical process; action or practice is achieved through direct experience in the game world. The model, which adopted constructivist and pragmatist learning theories, emphasized that both cognitive and behavioral activities are required for learning. According to the model, the game should be playable and provide clear goals and adequate feedback to facilitate the flow. Thus, the challenges in the game should be proportionate to the student level. As the player's skill improves, the difficulty of the game should also be increased, keeping the player in the flow. Too difficult or too simple challenges would break the flow of the player (Kiili, 2005). The game object model, developed by Amory (2007), explained the correlation between the pedagogical dimensions of learning and game components, and was based on the object-oriented programming paradigm. The game object model posited that an educational game includes abstract and concrete interface components. The abstract interfaces are associated with the pedagogical and theoretical structures in the game, while concrete interfaces refer to design elements (Amory, 2007). The model discussed game design in six dimensions: definition, authentic learning, story, gender, collaboration and competition. The model includes six spaces: the playground, the visualization space, the elemental space, the actors' space, the problem space, and the social space. The model discussed the educational games based on complex and related objects that were reduced to three main areas: struggle, narrative and conversation (Amory, 2007). Finally, the spiral educational game design model, which argued that the design and development of educational digital games should be conducted on two separate contexts, namely 'educational' and 'gaming', employed the "internal evaluation" component to minimize the regressions to each stage in the interconnected cyclical process (Akgün et al., 2011). In this model, the ADDIE model stages were represented in an interconnected cycle (Doğan et al., 2015). The model included four phases based on these cycles: analysis, design, development-implementation and evaluation. The gradual process starts with an educational analysis, which is then intertwined with the game analysis process. Then, it includes the stages of educational design and game design, and ends with the evaluation stage after the development and implementation stage. Internal evaluation is included in the evaluation phase, which is conducted after the development and implementation phases, all of which are intertwined throughout the process to minimize the need for retrospective changes (Akgün et al., 2011).

The employment of certain learning and motivation theories and game design models during the development of educational digital games would ensure the efficacy of the learning environments where these educational digital games would be used, and the robustness of learning in these environments. Previous studies strongly reported that the design of educational digital games should be based on contemporary learning theories (Young et al., 2012). In the literature, it was emphasized that educational digital games could yield effective outcomes only when they are designed on a theoretical foundation. Schunk (2012) argued that an application that was not based on a theory could often be wasteful and potentially harmful, resemble a trial-and-error method, and yield situation-specific outcomes. Schunk emphasized that theory without practice could mislead since it would underestimate the impact of situational factors and the implementers should consider the theoretical discussions.

Educational Digital Games in Turkish Language Instruction as a Second Language

Sykes and Reinhardt (2013) reported that both digital games and learning a second language have common components such as an objective, interaction, feedback, context and motivation. In a well-planned language instruction and a well-designed game, goals, interaction, feedback, context, and motivation work as parts of an integrated system, and when there is no balance across these parts, the system will fail. Language instruction and educational digital games have certain goals. Success in both depends on the interaction with the game and learning a language. Lack of feedback makes it difficult to continue the game or learning and reduces motivation. Context plays a vital role in educational digital games and in language instruction. In educational digital games, the context that keeps the student play the game also facilitates learning the target language in language instruction. Learning environments assisted by educational digital games and language instruction are based on various theories and various techniques are adopted to provide and maintain motivation in both. The collaboration between these components improves the potential of educational digital games in second language instruction, leading to an effective learning environment.

The commonalities between digital games and language learning and the common belief that digital games could be used in language instruction led to the development of a new field called "Digital Game-Based Language Learning (DGBLL)". This field was preceded by "Computer-Assisted Language Learning (CALL)". Computer-assisted language learning, a sub-field of computer-assisted learning (CAL), refers to the employment of computers as a learning aid in language instruction. One of the important components of computer-assisted language learning, which was described by Beatty (2010) as "any process where students develop their language

skills using a computer", is digital games (Beatty, 2010). Language learning with digital games emerged after the 2000s as a sub-branch of computer-assisted language learning (Alyaz & Akyıldız, 2018). Digital game-based language learning reflects the transfer of the advantages of educational digital games to language learning via digital games. Thomas (2012) argued that the learning principles underlying digital game-based language learning contribute to socio-cognitive learning approach that emphasizes both process- and product-based learning approach. According to Thomas, language learning process with digital games leads to a unique opportunity for the students to develop real communication and semantic skills instead of learning the language as a rules system at school (Thomas, 2012). Neville (2009) reported that language learning with digital games provides benefits and includes unique features for second language instruction as long as it is content-oriented, culture and task-based. Thus, digital games are valuable tools, especially for young children, in the instruction of Turkish as a second language.

Reinhardt and Sykes (2012) reported that digital games could be used in language learning based on two methods and called these "game-enriched" and "game-based" learning, which indicate the development goals of the educational games. The “game-enriched learning” refers to the employment of the games in the target language for learning, while “game-based learning” focuses on learning processes where games are deliberately designed for learning. In other words, the existing digital learning process conducted with games that were not specifically designed for education refers to game-enriched learning, while learning with games specifically designed for second language instruction refers to game-based learning. Although the terms "based" and "enriched" generally reflect the degree of integration between a game-based application and the learning-instruction process, "game-based learning" environments could also differ based on the degree of integration between the games and the learning-instruction process. Reinhardt and Sykes (2012) argued that the teacher plays a key role even when the game integration is comprehensive, and stated that a single resource was not adequate whether it was comprehensive or not in language learning, and the presence of several resources was more effective in language learning. They emphasized that the fact that digital games were a part of a larger learning ecology should be remembered in learning environments.

The Development of “Journey to Turkish” Educational Digital Game

In this section, the development of the educational digital game "Journey to Turkish" is discussed. The educational digital game “Journey to Turkish” was based on the constructivist learning theory and the social cognitive learning approach, a cognitive learning theory, the flow theory and ARCS-V model that were based on motivation theories. Constructivist educational environments employ the approaches that allow learners to take higher responsibilities and be more active (Akınoğlu, 2012). In the "Journey to Turkish" game, a constructivist learning environment was created by assigning reading-comprehension and writing tasks that required the students to take responsibility, actively participate in the game, and solve problems. The game entails a constructivist learning environment, since it includes a trial and error process and allows interpretation of the students' past and current experiences to update student knowledge (Felicia, 2009). Furthermore, active learning, which is significant component of the constructivist theory, requires the student to actively play the game, learn by playing the game, and learn by doing. The development of the game “Journey to Turkish” that aimed the acquisition of certain achievements within a game environment emphasized the social constructivist theory since it was based on the premise that the individual constructs knowledge by interacting with the environment, emphasizing an environment of interaction in instruction (Akınoğlu, 2012). On the other hand, since students should complete individual tasks in the game, and the game provides feedback and clues when they could not, the approach entailed the concepts of proximal development and cognitive scaffolding, which are significant concepts in social constructivist theory. In “Journey to Turkish”, students could sometimes fail in the assigned reading-comprehension and writing tasks, reflect on their reasons for failure, and develop related hypotheses. Then, they plan certain actions that could help resolve the problem, and adopt methods such as re-reading, rewriting, focusing on the keywords in the text, prioritizing the context, testing and evaluating their hypotheses; and thus, learning experientially. This also leads to the improvement of their self-regulation skills, significant in social cognitive learning theory. The game allows the students to observe their achievements or failures in reading comprehension and writing tasks, compare their achievements based on certain criteria, and when necessary, develop new strategies and adapt their attitudes and behavior based on these criteria.

The educational digital game presents clear objectives based on the flow theory components. The expectations from the students in each reading-comprehension and writing task are presented verbally and in writing in the game. Furthermore, the feedback system, one of the most important components of the flow theory, was functionally structured within the game, and the system was developed to provide instant feedback about success or failure of the student. The game includes seven sections, and the next section is always more difficult than the previous one based on the flow theory. However, since the student needs of the students were predetermined and the game was designed based on these requirements, the authors prevented the game to become extremely difficult for the students to allow them to stay in the flow. The development of the game was based on the traits of the students who are in fact children to focus on the principle of deep concentration, a component of the flow theory.

Student interest is kept alive via visuals, graphic design elements, music and colors adequate for children. The game tasks were structured with the approach that the student would always be in control, the game was divided into sections to raise temporal awareness, and the students were allowed to perceive the game as a reward via feedback. The game "Journey to Turkish" was also based on the ARCS-V model. Based on the components of the model, curiosity, stimulation, mystery, unsolved problems and other techniques were employed to attract student interest. Furthermore, the consistency of the game with the educational requirements of the students and clear game objectives were emphasized. To establish an element of trust, the student was allowed to develop positive expectations of success, and feedback that included clues and the assignments allowed the students to realize that success was not due to other factors such as luck, but her or his skills. To improve the player's sense of satisfaction, various rewards are presented in the game, and the player was supported and reinforced externally during the game. Furthermore, the students' Turkish reading comprehension and writing skills allowed them to transfer their knowledge acquired in the game to the courses, ensuring their satisfaction with the instruction. Increasing difficulty through the stages, and the student's self-development when playing the educational digital game led to a stability in the gameplay and the game improved the determination of the students to fulfill the learning goals.

The design of educational digital games based on an adequate model ensures the completion of the work within a shorter time and an effective product (Doğan et al., 2015). Thus, the design of the educational digital game was based on the "Spiral Educational Game Design Model" developed by Akgün et al. (2011). The spiral educational game design model includes four stages: analysis, design, development-implementation and evaluation. These stages are interconnected and cyclical in the model, and an "internal evaluation" is conducted at every stage to minimize returns to previous stages in the process (Akgün et al., 2011). In the model, unlike other models, both educational design and game design stages are intertwined (Akgün et al., 2011). The stages of the model are presented in Figure 1.

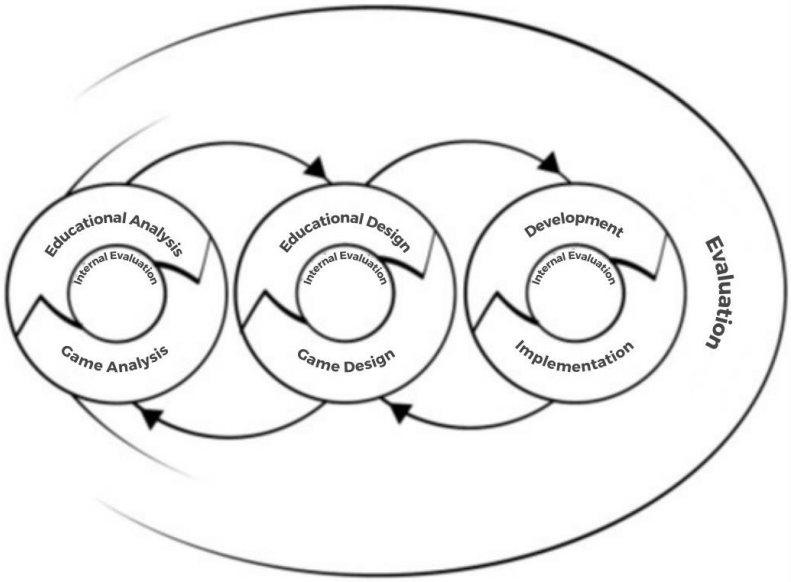

Figure 1. The spiral educational game design model (Akgün et al., 2011)

The spiral educational game design model includes cyclical stages and exhibits a gradual work approach. The cyclical process starts with an educational analysis phase, which is intertwined with game analysis in the process. This phase is followed by the educational and game design phases, leading to the development phase. As the development phase continues, the implementation phase is initiated. Retrospective change requirements are minimized in the evaluation phase, conducted after the development and implementation phases, which are intertwined with the internal evaluation conducted at each stage (Akgün et al., 2011). The educational game design process is detailed in Figure 2.

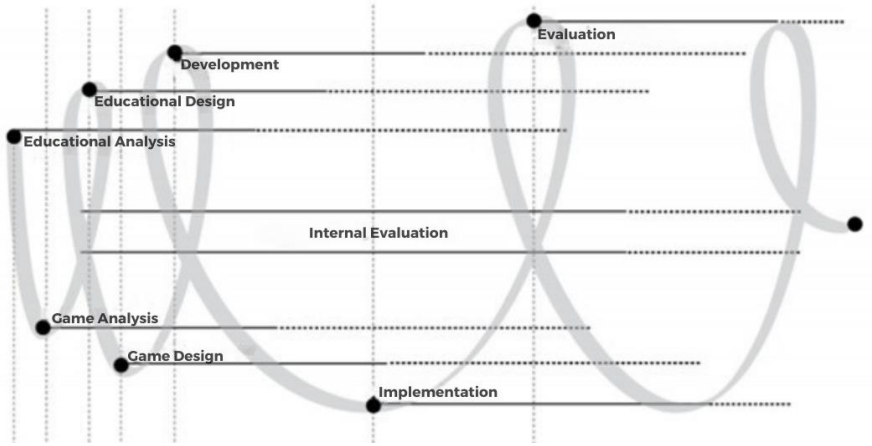

Figure 2. Educational game design process (Akgün et al., 2011)

Analysis: In the model, the analysis cycle includes the educational analysis and game analysis stages. Educational analysis precedes game analysis since educational properties should be prioritized in an educational digital game according to the model. In the model, the educational analysis phase starts before the game analysis and is intertwined with the game analysis in the following stages (Akgün et al., 2011). In the educational analysis phase, the educational requirements, properties, goals and the game content were determined for foreign primary school students who learn Turkish as a second language. In this stage, foreign primary school students were observed, interviews were conducted with the teachers, and a researcher diary was kept by the author. Thus, the difficulties experienced by foreign primary school students, their topical requirements, and the cultural elements that should be included were determined for needs analysis and due diligence. Furthermore, other problems and student requirements were determined with a literature review. The resulting findings demonstrated that the students required education in reading comprehension and writing at the most basic level, and it was decided that the game should cover the A1 language level content. A1 language level content was determined with the literature review. Six themes were determined at A1 language level. The student traits were also considered in content development. The content list was submitted to three field experts, one Primary School Turkish Language Instruction and two Teaching Turkish as a Second/Foreign Language specialists for review, and the content list was finalized based on their views. Thus, the following themes were included in the game: "Let us meet!, My class and home-My dearest!, Where?, My dear family, my one and only body!, What's up?, How is the weather?". The acquisitions, vocabulary and grammatical elements were also determined at this stage for each theme. In determining the acquisitions, the Common European Framework of Reference for Languages and the Turkish Maarif Foundation Turkish as a Foreign Language Program were taken as basis. In the game analysis stage, the required tools were determined based on the review of design tools, and how and why the game would be played was determined based on the educational analysis findings. The adequate game style was determined to achieve the predetermined goals in the educational analysis. It was decided that the game would be three-dimensional and played individually. Furthermore, based on the primary school student traits, the game was designed to be played from the first-person perspective of the player. Furthermore, it was decided that the game would include certain features of task-based role-play, and various types of tasks. The three-dimensional game included certain two-dimensional sections due to the structure of certain tasks, the developmental traits of primary school students, and the limited digital game experiences of the foreign primary school students. The three-dimensional structure of the game improves the realism and flow of the game, allows the player to internalize the game and raises interest. Thus, the game offers the student the opportunity to navigate in a virtual environment, to learn by doing-living, and to repeat the experience independent of time and space. Two-dimensional tasks are easier to play. Thus, the game was constructed to include different types of tasks (matching, puzzles, object finding, writing, dialogue, etc.).

Design: The design phase includes the educational design and game design sections. The educational design phase includes components such as motivation, interaction, narrative context, multiple perceptions, goals and rules, feedback, motivation, struggle, adaptation and records (Akgün et al., 2011). The employment of these components, syllabi, and instruction methods were decided in the educational design phase. In the phase, it was decided that the game should allow a balance between interaction and feedback, include activities that would keep the struggle alive, rewards to increase motivation, a context, and a record. Since the game was designed based on a needs analysis; hence, it included an adaptation component. In the educational design phase, initially, the story of the game, the game characters and script were determined. The script was designed based on the learning area and content determined in the needs analysis phase. The script included tasks that foreign primary school students should complete to improve their reading comprehension and writing skills. In the script, foreign primary school students visit seven cities, namely Eskişehir, Çanakkale, Nevşehir, Konya, Adıyaman, İzmir and İstanbul in Turkey, and collect certain cultural items as they complete these tasks. These places and cultural items were

determined based on the tangible and intangible cultural heritage list for Turkey. Educational design was conducted with field experts and was finalized based on the views of these field experts. The eight experts included four Turkish Instruction to Foreigners experts, two were Turkish Language Instruction in Primary School experts, and two were Computer and Instructional Technologies Education experts. Based on the views of the Turkish Language Education, spelling errors were corrected in the script, the location of certain grammatical topics was changed, the content was improved, and the cultural elements and their locations were changed. Based on the views of the Computer and Instructional Technologies Education experts, certain coding issues in the transfer of the script, and interaction and feedback problems were resolved in the narrative. The game design phase includes the commitment, challenge, reward and struggle components (Akgün et al., 2011). The employment of these components in the game was decided during the game design phase. The elements such as the player's travels in Turkey, visit to the cities, and collection of cultural item rewards in these cities were constructed for the connection component. These elements also fulfill the component of commitment by improving student motivation. Furthermore, the achievements determined in the educational analysis were presented to the students at a certain stage in the game and the game levels were constructed to be increasingly difficult to increase the player's sense of challenge and struggle. After these stages were decided, the software platform where the game would be developed was determined. The search was based on independent evaluation institution ratings. Unreal, Unity and CryEngine platforms (Alyaz & Akyıldız, 2018), which were in the top three on the 2017 and 2018 best game development software lists published by Redhat, Crowd and Discover SDK organizations, were reviewed. Thus, Unity 3D platform was preferred since it was free, supported artificial intelligence, was easy to use, included a large library, supported several hardware and operating systems, and included a store for required material. The platform has been frequently used in the development of educational games globally (Alyaz & Akyıldız, 2018).

Development-Implementation: In the development phase, scenes designed on the Unity platform, a three-dimensional game engine, were based on the scenes determined during the design phase. In this stage, characters and game interfaces, and speech screens were developed, and display objects were determined. The game menu was developed in this stage and the prototype game was coded. The screenshot of the game menu is presented in Image 1.

Image 1. The game menu

As seen in Image 1, the game menu was based on a map of Turkey and various items were included on the map. The menu included the new game, about, settings and exit buttons. The new game button allows the player to start a new game. The about button leads to information about the aim and content of the game and how to play the game, and the settings button leads to a section where the image settings could be changed. The exit button ends the game. On the upper left corner of the menu, seven silhouettes that could be won by playing the seven game levels are presented, and the silhouettes are colored when the player completes the level. The green arrow in the menu indicates the level of the player. The lock button in the lower right corner of the menu allows the player to enter the password and play any game level regardless of the original order.

An internal evaluation was conducted on the educational game in this stage, and submitted to Primary Education, Turkish Language Instruction and the Digital Game in Education experts and classroom teachers for review. The views of 12 experts, three of which were Turkish Language Instruction to Foreigners experts, two of which were Turkish Language Instruction in Primary School experts, four of which were Digital Game in Education experts,

and one Primary School Education expert, and two classroom teachers reviewed the game. Furthermore, a computer engineer in digital game development was also consulted. Based on the expert opinion, the game visuals, instructions, cues, the authenticity of the objects, and the sounds were revised. In the implementation phase, the prototype was tested by beta testers who included foreign primary school students under similar conditions to the game environment to determine the overlooked errors in the development phase. In this stage, interviews were developed for beta testers to evaluate the game based on different perspectives, and the gameplay of these students were observed by the author. Five foreign students were assigned as beta testers. Beta testers completed the game at various speeds, provided positive views on the game, experienced difficulties in certain levels, and presented several suggestions. The on-screen duration and frequency of the clues, the speed of the protagonist movements, the images of the objects, the sounds, and the font were revised based on beta tester feedback. Thus, the educational digital game was finalized before the evaluation phase based on the issues and suggestions observed in this stage.

Evaluation: In each game design stage, internal evaluation was conducted by the developer, and at the end, a comprehensive evaluation was conducted. The internal evaluations conducted in each stage minimized the need for retrospective revisions or changes.

The final version of the game, designed based on the spiral educational game design model, included seven levels. The first level of the game takes place in Eskişehir on the "Let's Meet!" theme. The content of the level included “meeting, greeting, asking questions, and numbers” and the grammatical structure included the “What is your name? My name is ….." phrase. This level takes place in Odunpazarı homes, Sazova Park and Porsuk Stream in Eskişehir. At the beginning of the level, the local folk song "Halkalı Şeker" is played in the background, and at the end of the level, the player is awarded a peg top, which is important in Turkish traditional game culture. The player is returned to the map at the end of the level, and an animation of an airplane that flies from Eskişehir to Çanakkale is presented. The analysis, design, implementation and evaluation stages of the game were conducted by the author, and the development phase was conducted by software developers and graphic designers. The third author of the article was one of the developers and played a major role in the development of the game. The images of the first level are presented in Image 2.

Image 2. First level images

The second level of the game takes place in Çanakkale on the "My class and home-My dearest!" theme. The level content includes “classroom and household items, colors, classroom language,” the grammatical structure included "What is this?, Who is this?, Where is this place?, demonstrative adjectives, palatal harmony, the plural suffix and interrogative particle". This levels begins around the Trojan Horse statue in Çanakkale province and continues in a classroom and a house. In the beginning of the level, the local folk song "Evreşe Yollları Dar" is played in the background, and at the end of the level, Turkish coffee, which is a significant Turkish cultural element, is presented as a reward. At the end of the level, the map is displayed and an airplane flies from Çanakkale to Nevşehir. The images of the second level are presented in Image 3.

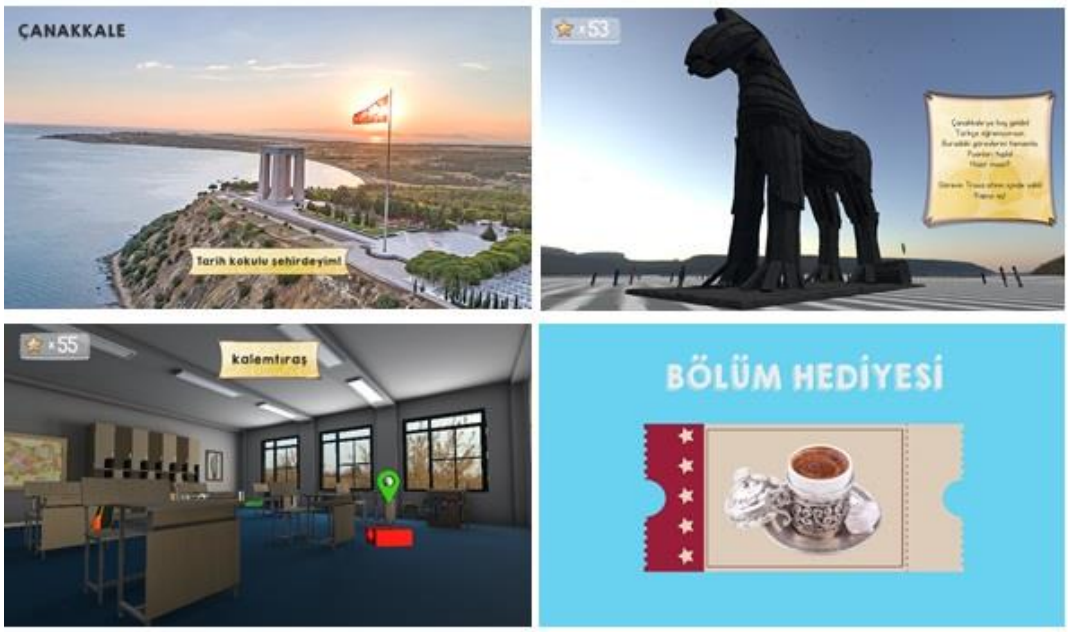

Image 3. Second level images

The third level takes place in the province of Nevşehir and the theme is "Where?". The level content includes “places, food and drinks,” and the grammatical structure includes "presence, consonant assimilation, exists-does not exist, is there/isn’t there?, and noun clauses". This level takes place in the Cappadocia region of Nevşehir province. In the beginning of the level, the local folk song “Dam Başında Sarı Çiçek (Feridem)" is played in the background, and at the end of the episode, "Menemen", a Turkish dish, is awarded. At the end of the level, the player is returned to the map and an airplane flies from Nevşehir to Konya. The images of the third level are presented in Image 4.

Image 4. Third level images

The fourth and fifth levels of the game are based on a single theme. These levels take place in the provinces of Konya and Adıyaman on the theme of “My dear family, my one and only body!" The level content includes “main relatives, professions, parts of the body, clothes, and animals,” and grammatical structure includes "possessive suffixes, terminal devoicing, haplology, and noun phrases." The fourth level takes place in the courtyard of the Mevlana Museum in Konya, and the fifth level takes place on Mount Nimrud in Adıyaman. In the beginning of the fourth level, the local folk song "Konyalı" is played in the background, and at the beginning of the fifth level, the local folk song "Nemrudun Kızı" is played in the background. At the end of the fourth level, the player is awarded with a "Whirling Dervish Show", a significant Turkish heritage, and at the end of the fifth level, the player is awarded with "Baklava", a Turkish desert. At the end of the level, the player is returned to the map. At the end of the fourth level, an airplane flies from Konya to Adıyaman and it flies from Adıyaman to İzmir at the end of the fifth level. The images of the fourth and fifth levels are presented in Images 5 and 6.

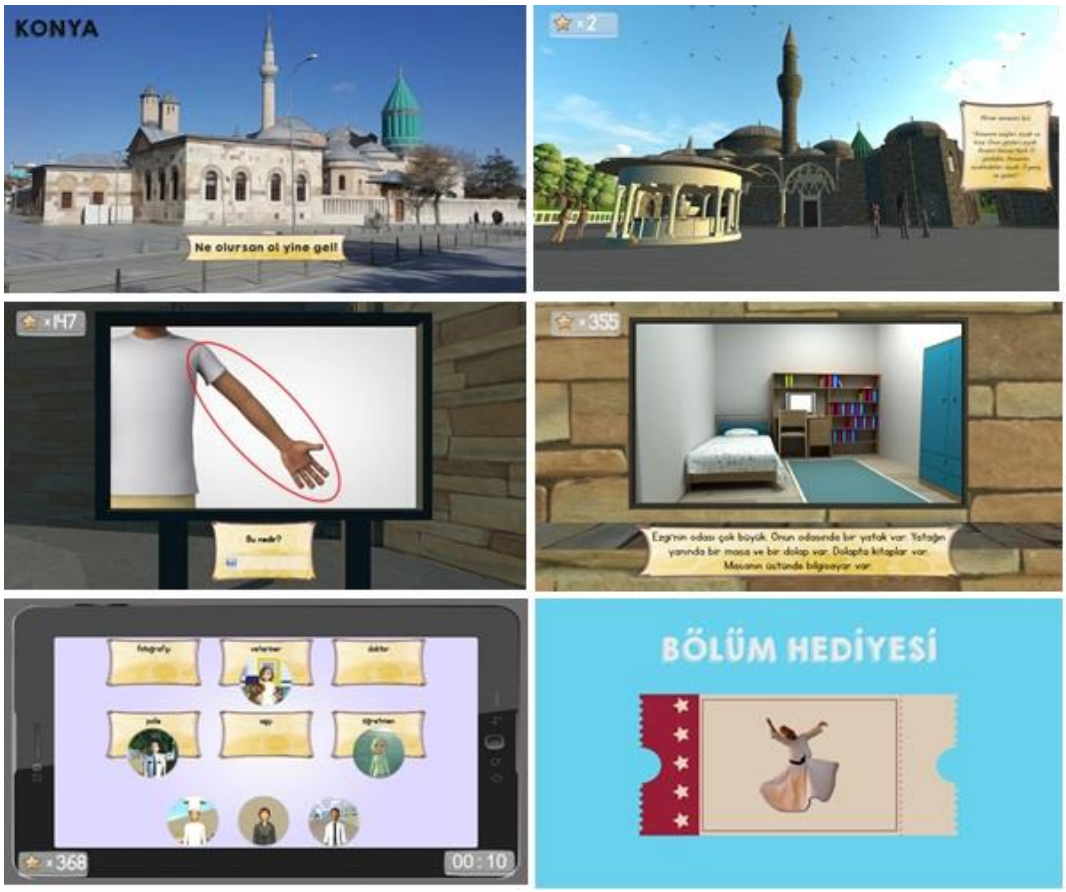

Image 5. Fourth level images

Image 6. Fifth level images

The sixth level of the game takes place in the province of Izmir and the theme is “What’s up?” The level content includes “basic verbs, basic features of the professions, and hours,” and grammatical structure included "present tense, vowel contraction, accusative, dative, and ablative". This level takes place in front of the Clock Tower in Izmir and in the Ancient City of Ephesus. In the beginning of the level, the local folk song "Darıldın mı Gülüm Bana"is played in the background, and at the end of the level, the player is awarded with the traditional Turkish shadow play "Karagöz-Hacivat Show". At the end of the episode, the player is returned to the map and an airplane flies from Izmir to Istanbul. The images of the sixth level are presented in Image 7.

Image 7. Sixth level images

The seventh level takes place in the province of Istanbul on the theme "How's the Weather?" The level content includes “days, months, seasons, weather, directions, numbers,” and the grammatical structure includes "ranking numbers, question patterns, and noun phrases". This level takes place in Maiden's Tower, Galata Tower and Sultan Ahmet Mosque in Istanbul. In the beginning of the level, the local folk song "Üsküdar’a Gider İken" is played in the background, and at the end of the level, the player is awarded with "Ottoman Paste", an important element of traditional Turkish culture. At the end of the level, the player is returned to the map, and an airplane flies over all the provinces visited in the game. The images of the seventh level are presented in Image 8.

Image 8. Seventh level images

CONCLUSION, DISCUSSION, AND RECOMMENDATIONS

Currently, novel language learning environments emerged due to the increase in the demand for learning Turkish language and technological advances. The present study aimed to develop a novel language learning environment for foreign primary school students who learn Turkish as a second language and to describe this process in detail. Thus, initially, the correlation between educational digital games and education was discussed, learning and motivation theories adequate for educational digital game development were investigated, the educational digital game design models, the employment of educational digital games in second language instruction, and spiral educational game design in the instruction of Turkish to foreign primary school students were addressed. The “Journey to Turkish” game was developed based on the constructivist learning theory and social cognitive learning approach, a cognitive learning theory, the flow theory, and the ARCS-V model based on the motivation theory. The game was designed with the spiral educational game design approach and included seven levels: “Let us meet!, My class and home-My dearest!, Where?, My dear family, my one and only body!, What’s up?, How is the weather?” The players visited seven cities, Eskişehir, Çanakkale, Nevşehir, Konya, Adıyaman, İzmir and İstanbul, and collected cultural items by completing reading and writing tasks during these visits.

Although there have been significant developments in the field of Turkish language instruction as a foreign/second language to adult students, it was observed that child students continued to experience problems, and it was reported that these difficulties included access to adequate language instruction material. Material is significant in language instruction. Materials that raise student interest, improve motivation, and ensure the permanence of learning, are indispensable elements in language instruction when they are developed based on the student level, and could meet student needs. In addition to the educational digital game "Journey to Turkish", a technological material was developed to improve the reading comprehension and writing skills of the students in the study.

Literature review would reveal that educational digital games have been developed for teaching English and German as a foreign language (Alyaz & Akyıldız, 2018; Büyükuygur & Güneş, 2018), chemistry instruction (Demir & Bayraktar, 2021), mythology (Arkün Kocadere et al., 2019), and computational thinking (Doğan et al., 2015). In the current study, it was observed that certain theories have also been adopted in digital games, and the designs have been based on a certain model.

Success will be achieved to the extent that the current paradigm shift observed in language use is reflected in language instruction methods and techniques. Studies demonstrated that foreign or second language instruction in technology-assisted classrooms is more effective when compared to conventional classrooms (Ghanizadeh et al., 2015; Zhao, 2003). Digital games are among the technological facilities available in language instruction and are attractive especially for primary school students. Several advantages of the digital games, such as student motivation, achievements, attitudes, thinking, communication and collaboration skills, are beneficial for educational environments (Beatty, 2010; Chuang & Chen, 2009; Herz, 2001; Huizinga et al., 2009; Sung et al., 2015). Thus, the idea of the employment of digital games along with conventional learning tools has been widely accepted and researched in the international literature. These studies reported that educational digital games were effective in second or foreign language instruction (Castillo-Cuesta, 2020; Chen & Yang, 2013; Hung et al., 2018; Rama et al., 2012; Ronimus et al., 2014; Samur, 2019). However, the review of current applications and the literature revealed no three-dimensional game-based learning material for the instruction of Turkish as a second language to children. The current application is expected to provide a different perspective for future studies in second language instruction and offer a different language learning experience to the learners through the game. The players could gain first-hand experience in the game, and the permanence of learning by first-hand experience is higher.

The following could be recommended based on the study findings:

- Educational digital games could be employed to improve Turkish language reading comprehension and writing skills of foreign students.
- Reading and writing skills in Turkish as a second language were addressed by the educational digital game developed in the current study. Listening and speaking skills could also be addressed by future educational digital games.
- Future educational digital games could be developed to improve reading and writing skills of the Turkish as a second language students.
- A1 language level topics were included in the educational digital game developed in the present study. Educational digital games could be developed to improve the Turkish language skills of foreign primary school students in different levels.
- Future educational digital games could employ artificial intelligence to prevent the problems that could be experienced during gameplay.
- Online educational digital games could be designed to improve communication skills of the students. Thus, peer instruction could be available online.
- Certain cultural elements were included in the educational digital game developed in the current study. In future educational digital games, the scope of these cultural elements could be broadened.

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