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The effect of teaching history subjects in social studies course with digital games on student academic success and creative thinking

El efecto de enseñar materias de historia con juegos digitales en el éxito académico y el pensamiento creativo de los estudiantes de un curso de estudios sociales

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Fatih Pala
Ministry of National Education, Türkiye
e-r-z-u-r-u-m-25@hotmail.com

ABSTRACT

The purpose of this research is to investigate the impact of digital games on students' academic achievement and creative thinking in teaching historical subjects in social studies classes. The data for the research were collected using a mixed-methods model. The study group consists of 7th-grade students from two separate classes studying in a school affiliated with the Ministry of National Education within the boundaries of Erzurum province during the 2022-2023 academic year. Class A represents the experimental group, while Class B represents the control group. A total of 62 students participated in the research, with 31 in the experimental group and 31 in the control group. The quantitative data of the research were collected through Torrance Creative Thinking Test Verbal A-B Forms, an academic achievement test developed by the researcher, and a teacher observation form. The qualitative data were gathered using a semi-structured interview form developed by the researcher. The quantitative data analysis of the research was conducted using the SPSS 21.0 package program. A normality test was performed to determine whether the data followed a normal distribution. Parametric tests such as "Paired Samples t-test, Independent Samples t-test, and ANOVA" were used for the analysis of data showing normal distribution, whereas non-parametric tests like "Mann Whitney U Test and Wilcoxon Signed-Rank Test" were utilized for data that did not exhibit normal distribution. The qualitative data of the research were collected through the "Interview Form" and analyzed using content analysis with the MAQODA 20 analysis program. As a result of the research, it was concluded that digital games increased students' academic achievement and encouraged creative thinking. Additionally, according to student opinions, digital games influenced digital principles, creative thinking activities, and types of games. Students faced challenges in creating video games, particularly with video and writing applications during the process of digital game creation. In the research, considering that some students are more engaged in the fun and creative activities of lessons conducted through digital games, efforts should be directed towards enhancing student creativity and fostering a greater focus on learning. Given the recent development of digital games in various aspects of life, there is a need for further research in the field of digital game applications for educational purposes.

KEYWORDS Social studies; digital game-based learning; history teaching; academic achievement; creative thinking.

RESUMEN

El propósito de esta investigación es investigar el impacto de los juegos digitales en el rendimiento académico y el pensamiento creativo de los estudiantes en la enseñanza de materias históricas en las clases de estudios sociales. Los datos para la investigación se recopilaron mediante un modelo de métodos mixtos. El grupo de estudio está formado por estudiantes de séptimo grado de dos clases separadas que estudian en una escuela afiliada al Ministerio de Educación Nacional dentro de los límites de la provincia de Erzurum durante el año académico 2022-2023. La clase A representa el grupo experimental, mientras que la clase B representa el grupo de control. Un total de 62 estudiantes participaron en la investigación, 31 en el grupo experimental y 31 en el grupo de control. Los datos cuantitativos de la investigación se recopilaron a través de Torrance Creative Thinking Test Verbal A-B Forms, una prueba de rendimiento académico desarrollada por el investigador y un formulario de observación del maestro. Los datos cualitativos se recopilaron mediante un formulario de entrevista semiestructurada desarrollado por el investigador. El análisis de datos cuantitativos de la investigación se realizó utilizando el paquete de programas SPSS 21.0. Se realizó una prueba de normalidad para determinar si los datos seguían una distribución normal. Se utilizaron pruebas paramétricas como la "prueba t de muestras pareadas, la prueba t de muestras independientes y ANOVA" para el análisis de los datos que muestran una distribución normal, mientras que se utilizaron pruebas no paramétricas como la "prueba U de Mann Whitney y la prueba de rangos con signo de Wilcoxon". utilizado para datos que no exhibieron una distribución normal. Los datos cualitativos de la investigación fueron recolectados a través del "Formulario de Entrevista" y analizados mediante análisis de contenido con el programa de análisis MAQODA 20. Como resultado de la investigación, se concluyó que los juegos digitales aumentaron el rendimiento académico de los estudiantes y fomentaron el pensamiento creativo. Además, según las opiniones de los estudiantes, los juegos digitales influyeron en los principios digitales, las actividades de pensamiento creativo y los tipos de juegos. Los estudiantes enfrentaron desafíos en la creación de videojuegos, particularmente con aplicaciones de video y escritura durante el proceso de creación de juegos digitales. El estudio debe enfocarse en el desarrollo de la creatividad de los estudiantes y en la capacidad de centrarse más en el aprendizaje, teniendo en cuenta que algunos estudiantes participan más en actividades lúdicas y creativas en lecciones impartidas con juegos digitales. Dada la reciente expansión de las aplicaciones de juegos digitales en todos los aspectos de la vida, se necesita más investigación en los estudios de aplicaciones de juegos digitales orientadas a la educación.

PALABRAS CLAVE Estudios sociales; juego digital basado en el aprendizaje; enseñanza de historia; rendimiento académico; pensamiento creativo.

1. INTRODUCTION

The education system undergoes continuous changes with technological advancements, providing opportunities to offer more effective learning methods to students. In today's world, games have become a significant activity for children (Avidov-Ungar & Hayak, 2021; Mohanty et al., 2021). Games have recently captured the interest not only of children and teenagers but also of adults (Hébert et al., 2021). The importance of games today stems from their use as a source of entertainment for individuals. Engaging in games can be beneficial for individuals while also being a source of enjoyment. For instance, the use of digital games in education leads to the emergence of Digital Game-Based Learning (DGBL) (Chen et al., 2020; Perininet al., 2018).

In recent years, the integration of digital games into educational processes has the potential to provide students with effective and interactive learning experiences. Educational digital games have been shown to enhance students' learning levels and develop various creative abilities (Behnamnia et al., 2020). Digital games allow students to creatively tackle real-world problems (Cook & Bush, 2018). By positively influencing students' psychology, digital games enhance creative thinking skills. Therefore, digital games effectively contribute to

increasing students' real-life creative thinking skills and addressing challenges, exploring abilities, increasing motivation, and finding solutions to enhance learning (Avidov-Ungar & Hayak, 2021; Hsiao et al., 2014). Digital games play a role as tools to emphasize students' critical and creative thinking skills. Defined as technological tools where learning is concretely embodied, digital games enable students to solve their individual problems and make more creative decisions (Brunnet & Portugal, 2016; Gilavand, 2019; Hébert et al., 2021). There is a growing interest in using digital games in education. Digital games offer advantages such as making learning enjoyable, enhancing collaboration skills, and improving problem-solving abilities. These benefits can contribute to students learning historical topics more effectively in social studies classes. The potential of teaching historical events and concepts through digital games allows students to experience a more interactive and experiential learning process (Breien & Wasson, 2021; Chen et al., 2020; Pinto et al., 2023). While exploring historical contexts, students can enrich their learning experiences with activities such as making decisions, solving scenarios, and actively participating in historical events. This approach may help students develop in-depth understanding and critical thinking skills instead of simply memorizing information. Teaching history through digital games can increase students' capacities for creative thinking (Cook & Bush, 2018). Since games require problem-solving and strategy development, they can strengthen students' analytical thinking abilities. Additionally, by allowing students to evaluate and criticize historical events from different perspectives, games can support their creativity (Avidov-Ungar & Hayak, 2021; Ortega-Rodríguez et al., 2022). Especially in social studies classes, the aim is to provide students with a broad perspective on history, geography, culture, and societal issues to enhance awareness and develop critical thinking skills. In this context, the subject to be examined in this article is the impact of teaching history topics through digital games in social studies classes on students' academic success and creative thinking. Understanding how this innovative approach plays a role in strengthening students' abilities to comprehend, analyze, and criticize historical events indicates potential transformations in the field of education (Behnamnia et al., 2020).

1.1. Educational digital games

Teachers use various learning tools to motivate students for the lesson. Teachers who want to use an effective teaching tool in their lessons today apply digital games (Byun & Joung, 2018). Digital games are created on computers, smart phones and video games, keeping the student's knowledge in balance with real-life scenarios. An effective digital game must encourage students to experience the results of their actions by choosing the target they want to reach correctly. With digital games, students learn by trial and error by making mistakes in the learning process. It also allows them to design their own actions and review the process (Ashraf, 2020; Breien & Wasson, 2021; Chen et al.,2020; Kucher, 2021).

When applying digital games in education, it is necessary to design a game that includes teaching methods. Digital game applications should be at a level that will attract the attention of the student and motivate them for the lesson. Digital games in our age are divided into games and simulators (Chang et al., 2018). In games, there are goals and levels. It progresses gradually and successful completion of the task is ensured. A measurement is provided according to the skill acquired by the student (Kumar et al., 2021a). In simulation, learning takes place by interacting in an environment designed to animate the environment in which the individuals will apply their skills and knowledge in the computer environment. However, a simulation

is self-explanatory. One learns by interacting with a computerized environment designed to simulate the environment in which one will eventually apply their skills and knowledge (Alam, 2020; Wu et al., 2020).

Recently, there have been certain principles of digital games extensively utilized in education (Ashraf, 2020). Digital games empower students' creativity by offering opportunities to generate knowledge. The fundamental principles of digital games establish the basis of interaction in learning by connecting learning principles in digital environments (Wilson et al., 2020) and enhancing learning (Hsiao et al., 2014; Kaul et al., 2017).

Teachers who use digital games in their classes expect positive outcomes in students (Alam, 2020; Wu et al., 2020). Additionally, teachers desire a certain level of efficiency in the digital games they use in their classrooms (Kumar et al., 2021a). Students generally have high self-efficacy in operating digital games (Alam, 2020; Kumar et al., 2021a; Kumar et al., 2021b). Moreover, teachers need to have a certain level of competence to implement digital games in their classes (Gerber & Price, 2013).

1.2. Educational digital games and creative thinking

Creativity is generally defined as a human trait that brings forth positive emotions and personal satisfaction. The creative process is thought to be interdependent with creative domains, and the potential for creativity is considered to manifest in everyday creative actions (Csikszentmihalyi, 1996; Sternberg, 2012). The creative thinking process is identified in all individuals as the "capacity for original interpretation" and is characterized as an individual's ability for creative thinking without expertise or domain dependency. This process is emphasized as a central skill for all students in education (Kaufman & Beghetto, 2009). However, the insufficient inclusion of creativity in educational curricula is considered a significant limitation in modern school systems, despite the acknowledgment of the importance of creative and innovative thinking in all academic disciplines (Gangadharbatla, 2010; Root-Bernstein & Root-Bernstein, 1999).

Gangadharbatla (2010) expresses the need for new systems to understand the creative process, highlighting the necessity for technology integration. This suggests that technology tools can offer significant opportunities for fostering creative thinking in educational environments, providing various possibilities for students to enhance their creativity. Klausen (2010) points out the uncertainty about how students can be encouraged to think creatively in technology environments, emphasizing a lack of experimental groundwork in this regard. There is highlighted tension between technology-integrated learning and existing standards-based education. The conflict regarding whether the current educational standards are conducive to enhancing creative thinking skills is particularly emphasized. The avoidance of transformative and educational use of technology in traditional schools is noted, indicating a failure to fully leverage the potential of technology.

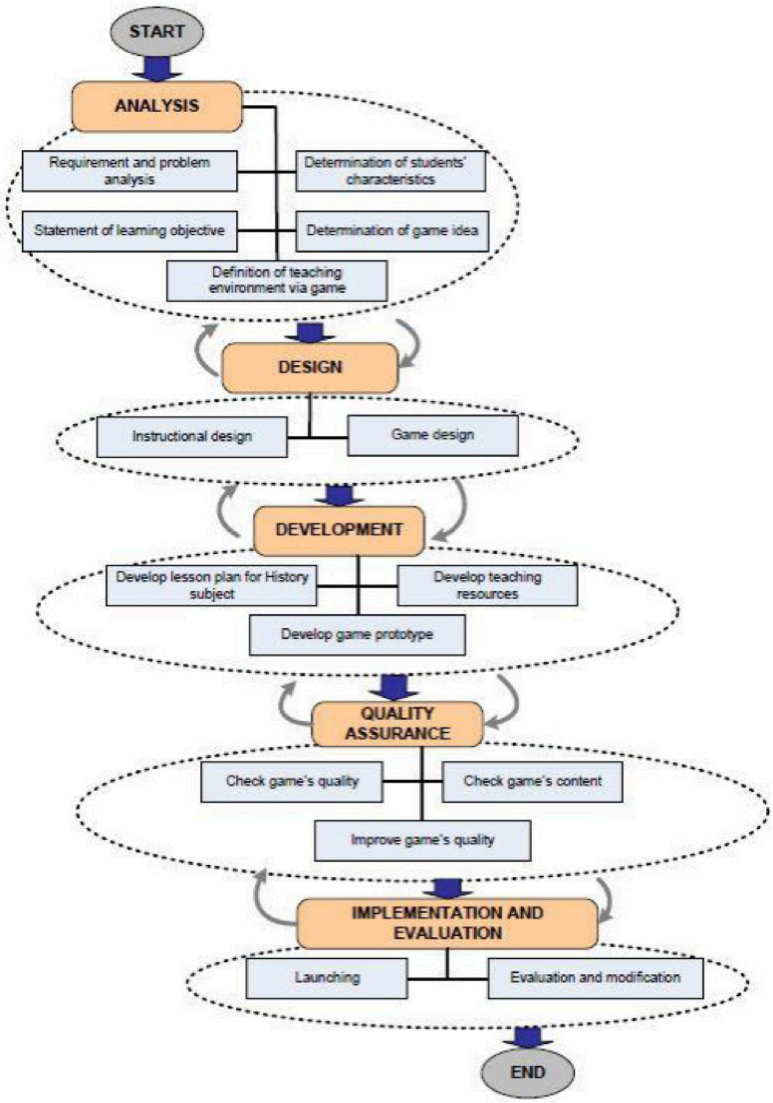
Researchers have suggested that the digital writing process can provide a robust learning environment and offer an opportunity for creative thinking directed towards internal learning. This indicates that students can not only create games but also enhance their digital writing skills (Robertson & Howells, 2008). Baytak and Land (2011) state that students can design games within a constructivist framework, and as design experience increases, so does their programming skills. Vos et al. (2011) suggest that game creation may be more motivating than game playing and can provide opportunities for using "deep learning strategies." Reynolds and Caperton (2011) determine that educational game design can provide an interesting and useful context for students to explore theoretical questions and discussions, engaging them in creative

thinking and presenting a positive learning experience. Game design and programming hold central importance in the development of technological literacy, supporting traditional text-based literacy (Caperton, 2010). Kafai (2006) expresses that the special role of games in contemporary children's culture, combined with a profound sense of attachment to activities related to games, creates a new and promising context for game studies. The reviewed literature demonstrates that understanding the creative thinking process in students during game design and development is crucial for addressing current educational challenges.

1.3. Using educational digital games in history education

The use of digital games holds significance in education, particularly in teaching history topics within social studies classes. The density of historical topics and the difficulty in using various teaching materials during class often lead to student boredom. Therefore, using digital games in teaching history topics in social studies classes can be beneficial. The model developed for history education through digital game-based learning holds significance in emphasizing the importance of digital games in teaching history topics (Zin et al., 2009). The foundational approach diagram and stages of digital game development for history-based learning are provided below.

FIGURE 1. Development of a History Teaching DGBL method (Zin et al., 2009)



Digital games, that have attracted great interest in education, have also started to be used in history teaching. Such games have started to be used, especially in social studies and history lessons. In this context, the use of digital games in history teaching has been the subject of research by drawing attention of many researchers. In the study of Wainwright (2014), who pioneered the studies in this field, applied the game called "Civilization" to history education. In this study, the effectiveness of the game in teaching critical thinking and history subjects was revealed. In their study Cruz et al. (2017) and Yu, et al., (2014) concluded that history teaching games have a positive effect on history teaching. In the study of Wainwright (2014) a similar conclusion was reached, as in other studies. In their study, Haataja et al.(2019) adapted "Assassin's Creed" to history subjects and as a result of the research, they concluded that students' interest in historical subjects increased, and they were more willing to produce new ideas on this subject. Alam (2020) and Kumari et al. (2021) investigated the effect on understanding historical subjects with the play "Europa Universalis II". Cózar-Gutiérrez and Sáez-López (2016) applied the game "Minecraft Edu" in history lessons and concluded that the game had a positive effect on student motivation and participation in the lesson. There are more studies reaching similar results (Bell & Gresalfi, 2017; Dukuzumuremyi & Siklander, 2018). Studies on history teaching mostly emphasize the development of students' understanding of historical subjects, critical thinking, decision making and problem-solving skills.

Digital games constitute the main purpose in terms of transferring the objectives in the curriculum to students. The main purpose here is digital-based games should not only serve as a means of entertainment, but also aim to reach the main goals of education by enabling students to develop creativity, attention and motivation. Considering the studies on the subject, there are not many studies aimed at improving student creativity and academic achievement of digital-based games used in history teaching. For this reason, there was a need for a study on the effect of digital games on students' academic achievement and creativity in teaching of history subjects in Social Studies course. Within the context of this purpose, a digital game for history teaching named "History with Me", which is about the "Culture and Heritage" unit of the Social Studies course, was designed. The game designed by students aims to reveal its effect on both the process and the course achievement and creativity. Within the context of this purpose, the problem sentence of the research is: How do digital games used in the teaching of history subjects in the Social Studies course effect the academic achievement and creative thinking of students? The sub-problems of the research are:

1. Is there a difference in achievement pre-post test scores between the control and experimental groups?
2. Is there a difference in creative thinking skills pre-post test scores between the control and experimental groups?
3. According to teacher observations, is there a difference in the performance of the control and experimental groups throughout the study period (pre-activity, during, and post-activity)?
4. What are the opinions of the experimental group students regarding the use of digital games in history teaching?

2. MATERIAL AND METHOD

2.1. Research model

The study investigating the impact of digital games on students' academic achievement and creativity in teaching history topics within the Social Studies course was conducted using a mixed research method, employing an explanatory sequential design. This design consists of two stages. In the first stage, quantitative data is collected, while in the second stage, qualitative data is gathered. In this design, multiple data collection tools (interviews, observations, visual and auditory materials, reports, documents) are used to collect data, which is then analyzed in-depth and categorized into themes (Creswell, 2016; Creswell & Clark, 2015). The quantitative data of the research was collected through a pre-test post-test control group experimental design, whereas the qualitative data followed a case study design.

FIGURE 2. Research model

2.2. Study group

The research study consists of 7th-grade students attending a school affiliated with the Ministry of National Education within the borders of Erzurum province in the 2022-2023 academic year, forming two separate classes. Class A represents the experimental group, while Class B represents the control group. A total of 62 students participated in the research, with 31 in the experimental group and 31 in the control group. Of these students, 30 are female, and 32 are male. It should be noted that the classes are not divided based on academic levels. In accordance with this, information was obtained from the school administration regarding how students were assigned to classes. It was indicated by the school administration that students were randomly assigned to classes, and the class levels were generally similar. In quantitative research methods, a probability-based sampling method, specifically random sampling, was employed. This type of sampling, based on probability theory, generally constitutes "good" samples (Christensen et al., 2014).

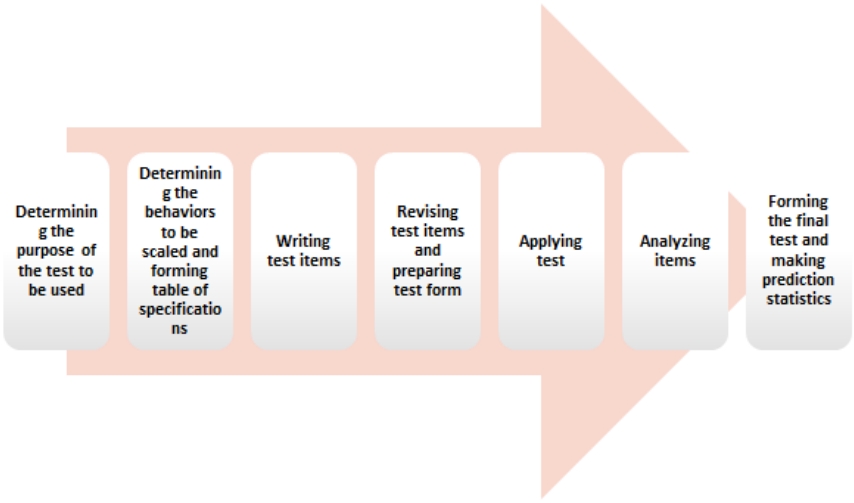
2.3. Data collection tools

Quantitative data of the study was collected with Torrance Creative Thinking Test Verbal A-B Forms, academic achievement test developed by the researcher, and teacher observation form. Qualitative data was collected with a semi-structured interview form developed by the researcher.

2.3.1. Achievement test

In the study, an achievement test was developed by the researcher to determine the academic achievement levels of the students. During the development process of the achievement test, an achievement test was developed by considering Crocker and Algina (1986). The development stages of the achievement test to be used in the research are indicated in the figure below.

FIGURE 3. The process of forming achievement test



The researcher prepared an achievement test to determine the level of knowledge of students participating in the study regarding the subject area before the experimental procedure and to measure their academic success after the experimental procedure. The process of preparing the achievement test took place in three stages.

In the first stage, a question pool was created taking into account the scope validity according to the achievements of the 7th-grade Culture and Heritage unit in the Social Studies Course. Source books and the 7th-grade Social Studies textbook were utilized in the preparation of the questions. While developing the achievement test, the achievements of the Culture and Heritage unit were taken into consideration.

In the second stage, considering the scope validity, the selection of questions for the pilot test was carried out, and the achievement test was prepared. The opinions of Social Studies teachers, educators in the field of Social Studies education, and faculty members working in the field of measurement and evaluation were obtained regarding question selection and scope validity in the prepared test. Necessary adjustments were made based on the opinions and suggestions of subject matter experts. A pilot test was then created in line with the opinions of experts. Subsequently, pilot implementation was carried out with the necessary permissions obtained from the Provincial Directorate and the Provincial Board of Education.

In the third stage, a reliability and item analysis study was conducted. Since the measurement tool used was multiple-choice, KR-20 reliability was examined. After the analyses, the questions were organized, and the achievement test was finalized by seeking expert opinions again. Considering the Academic Achievement test, the statistics related to the test are indicated in the table below.

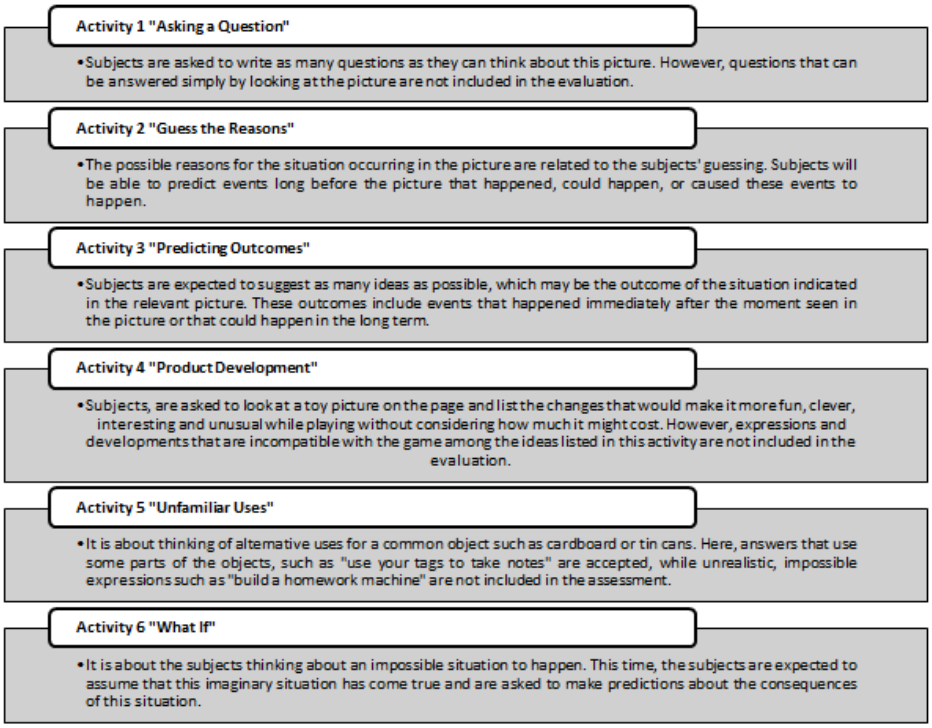
TABLE 1. Achievement test results statistic results

STATISTICS	VALUE
Number of questions	34
Average	14.789
Standard Deviation	7.096
Index of Distinctiveness	0.542
Difficulty Index	0.438
Coefficient of Reliability	0.876

2.3.2. Torrance creative thinking test (TCTT) verbal A-B forms

Considering former studies, it is seen that Torrance Creative Thinking Tests (TCTT) is the most cited test among the creative thinking tests. In addition, TCTT has a special importance as it directly measures creativity in terms of content (Kim, 2007). In this context, Torrance Creative Thinking Test Verbal A and B forms were used to measure the creativity of the students participating in the study considering digital games used in teaching of social studies course history subjects. The test was developed by Torrance in 1966. TCTT consists of four distinct factors: Fluency (idea), Flexibility (change), Originality (original idea) and elaboration (detail) (Kim, 2007; Torrance, 1972). Torrance Verbal Test of Creative Thinking consists of two distinct categories, A and B. This test can be applied to all age groups, from kindergarten to adults. There are six activities in each form of the test. In the test, 5 minutes are given for the 1st, 2nd, 3rd and 6th activities, and 10 minutes for the 4th and 5th activities. In total, the application time of the test is 40 minutes. TCTT is performed by calculating the sums of fluency, flexibility and originality measurement scores in 6 activities. In the TCTT Form, the first three of the activities begin with an indefinite picture. TCTT activities are indicated in the figure below.

FIGURE 4. Torrance creative thinking test (TCTT) verbal A-B forms activities



A validity and reliability study of TCTT was conducted. It was concluded that it had predictive validity in the tests performed. According to Cropley (2000), In the TCTT reliability study conducted by Torrance (1972), the reliability coefficient averages between the tests were not below 0.10. In the validity and reliability studies conducted for TCTT (Sungur, 1988), test-retest reliability correlation coefficients were found between 0.80 and 0.90. Aslan (2001), on the other hand, conducted TCTT reliability and validity studies and found that the correlation coefficients between the scores obtained in the test were significant at the $p<0.01$ level in all subtests. In the internal consistency calculation, correlation coefficients between ($r=0.38$) and ($r=0.89$) were obtained with Spearman Brown, Cronbach Alpha and Guttmann formulas. The lowest score of the group was calculated as the Cronbach Alpha value (0.50), and the highest internal consistency coefficient was found (0.71).

2.3.3. Interview form

In the study, it was aimed to investigate the effect of digital games on academic achievement and creative thinking in teaching social studies history subjects. In this process, digital games for history teaching were designed with students. It will also be important for future researches to examine deeply the thoughts of students involved in the studies regarding the process. In this context, the interview form was considered appropriate to receive the opinions of people and a semi-structured interview form was created by the researcher. The form was prepared by taking the opinions of academicians and teachers who are experts in their fields. Interview form was prepared in four categories. It was discussed in four sub-dimensions: (1) the effect of digital games on digital game principles, (2) the effect of digital games on game types, (3) the effect of digital games on creative thinking activities, and (4) the difficulties encountered in designing digital games. Interview questions were prepared as open-ended by examining the literature and put in a certain order (Karasar, 2002; Yıldırım & Şimşek, 2005). The interview form was given its final form by taking expert opinions.

The interview form consists of 4 questions. In order to inform the people who participated in the interview, an introduction section was added to the interview form and information about the interview process was given. In the interviews, both a voice recorder was used, and notes were taken. The MAXQODA 20 program was used in the analysis of the interviews. The data was analyzed by categorizing and presented in tables and graphs.

For the content validity of the prepared interview questions, opinions were received from academicians, who are experts regarding the subject. The pre-application interview questions were subjected to a pilot scheme. For the reliability of the interview, special care was taken to ask each question in the same way to all interviewees. For the analysis reliability of the interviews, the categories were coded to another person other than the researcher, and the percentage of agreement between them was checked. In addition, for coding reliability, the data was coded two separate times, and it was checked whether the same sentences were coded in the same category in both coding. Data that was not coded into the same category was excluded.

2.3.4. Teacher observation form

In the process of collecting the data of the research, a “structured observation form” was also used. An observation form was created by examining the literature about the behaviors of students during the activity

process (Goodson & Layzer, 2006). Observation form consists of three parts: before the activity, during the activity and after the activity. The observation form consists of items developed to code student behaviors. Each item was coded as 1 if it was observed once during the activity, and 0 if it was not observed at all. In addition, item frequencies were not coded. Before coding the data, two coders coded an experimental activity regarding how to code the observation forms. Cohen's kappa coefficient was calculated to ensure reliability among the coders, and it was found as $\kappa = .89$.

2.4. Process

The steps of the research process are listed as follows:

1. A proficiency test related to the "7th grade social studies curriculum culture and heritage learning area" has been prepared by the researcher.
2. Permission has been obtained from the provincial directorate of national education and relevant departments to pilot the proficiency test in order to test its validity and reliability.
3. The proficiency test has been pilot-tested to determine its validity and reliability.
4. Information has been acquired from relevant sources regarding the application and evaluation process of the "Torrance creative thinking verbal forms A and B" used as the data collection tool in the research.
5. A discussion form has been prepared by the researcher after obtaining opinions from expert academicians and teachers related to the subject.
6. The discussion form, refined based on expert opinions for content validity, has been administered to a total of 31 individuals after scheduling appointments.
7. Digital games designed to enhance students' academic achievement and creative thinking skills related to the "7th grade social studies curriculum culture and heritage learning area" have been created by reviewing the literature.
8. Approval has been obtained from the "ethics committee" and the "provincial directorate of national education" to conduct the application in a middle school within the boundaries of Erzurum during the first term of the 2022-2023 academic year.
9. A digital platform for the digital game application environment focused on teaching history topics in social studies has been prepared.
10. The classroom environment of the selected school for the application has been adjusted to be suitable for the experimental study.
11. Materials for the digital games planned for the "7th grade social studies curriculum culture and heritage learning area" have been transferred to the digital environment.
12. Two separate 7th-grade classes in the selected school have been randomly chosen. One class will follow the regular curriculum, while the other will be subjected to the application of digital games designed for teaching history in social studies.
13. A meeting has been held with the parents of the students involved in the experimental phase of the research with the approval of the school administration, providing them with information about their children's participation in the application study.

14. An introductory training of 8 hours has been conducted by the researcher for the group that will be involved in the digital games designed for teaching history in social studies.
15. Digital games for teaching history in social studies have been developed for a duration of 10 weeks.
16. Pre-test applications of "proficiency test and TCTT verbal form a" have been conducted for the selected experimental and control groups.
17. The experimental group was exposed to the digital games developed for teaching history in social studies, while the control group followed the regular curriculum methods and techniques for a period of 10 weeks.
18. At the end of the research, the "proficiency test and TCTT verbal form b" were administered as the final test to the experimental and control groups.

2.5. The process of creating a digital game

1. Initially, the basic idea and concept of the game were developed in collaboration with the students. At this stage, fundamental features such as the game's story, objectives, and main characters were determined.
2. Students, together with the researcher, designed the story of their game.
3. Students, in collaboration with the researcher, addressed elements such as game map designs and difficulty levels.
4. Designing the main characters and other characters was left to the responsibility of the students. Features such as the appearance and structures of animations were determined.
5. Rules and mechanics regarding how the game would be played were developed in collaboration with students. This included determining how players would interact and how the game would progress.
6. When designing the game's graphics, interface, and visual elements, students were assigned specific tasks. This stage involved creating animations and effects.
7. Students' opinions were taken into account when designing the game's sound effects and music. It was emphasized to students that sound design is crucial to enhance the atmosphere and emotional impact of the game.
8. To build the technical infrastructure of the game, students were shown relevant studies by the researcher.
9. At every stage of game design, the researcher and students tested the games to identify and correct errors, balance the gameplay, and optimize the overall gaming experience. Feedback was provided throughout the process.

2.6. Why the 'History with Me' game?

1. The game has the ability to operate on multiple platforms. The game provides the opportunity to work on different platforms, reaching a wider audience.
2. The game offers impressive visual effects, which are important for simulations or learning materials.
3. This game is a significant advantage for historical knowledge and problem-solving.

4. History topics are visually explained better through the game, making it more engaging for students.
5. The game's compatibility with different applications allows students to learn anytime, anywhere.

2.7. Analysis of data

The analysis of the data consists of two parts: quantitative and qualitative.

Quantitative data of the research was collected with "Academic Achievement Test and Torrance Creative Thinking Test Verbal A-B Forms and Teacher Observation Form". The "Academic Achievement Test" developed by the researcher consists of 30 questions, 24 of which are multiple choice and 6 of which are open-ended. Scores of the students from the multiple-choice questions in academic achievement test were scored according to the answer key created by the researcher. A maximum of 24 points is taken, with 1 point for each question. The lowest score was 0. The answers given by the students to the open-ended questions were evaluated in the context of creative thinking, fluency, flexibility and originality according to sub-dimensions. Student scores differ in the questions prepared in this category. The evaluation criteria of open-ended questions were evaluated in the context of the student's answer being appropriate for the question and having the quality of an answer. In this context, students received 1 fluency score for all answers. In addition, the answers given by all students for each open-ended question were divided into categories and 1 flexibility point was given for each category. Then, by reading the answers given by the students for each open-ended question, frequencies were created, and originality scores were determined according to the frequency of the answers given. For the score reliability of open-ended questions, another academician who worked on creativity apart from the researcher of the study made scoring. The correlational coefficient between scores the inter-rater reliability coefficient for the "TCTT Verbal A Form" was found 0.92, and the inter-rater reliability coefficient for the "TCTT Verbal B" was 0.93. Teacher observation form consists of three parts: before the activity, during the activity and after the activity. The teacher observation form consists of items developed to code student behaviors. Each item was coded as 1 if it was observed once during the activity, and 0 if it was not observed at all. In addition, item frequencies were not coded. There are 15 items in each part of the form, which consists of 45 items in total. The total score from each section is 15 and the total score is 45. In the analysis of the data, the analysis was made based on the total score obtained by the student from three sections. The analysis of the quantitative data of the research was conducted with the SPSS 21.0 package program. The normality test was performed to test whether the data of the study was normally distributed. "Related Samples t-test, Unrelated Samples t-test and ANOVA" were used in the analysis of normally distributed data, and non-parametric "Mann Whitney U Test and Wilcoxon Signed Rank Test" were used in the analysis of data that did not indicate normal distribution.

Qualitative data of the research was collected with the "Interview Form". The data obtained during the interview was analyzed by content analysis. MAQODA 20 analysis program was used in the analysis of the data. The data collected with the voice recorder was transferred to MAQODA 20 program and written. The data obtained from the interviews was organized by removing the unnecessary parts. During the coding phase of the data, codes were divided into categories (themes) determined according to the questions in the interview form. The codes created according to the questions in the interview form were brought together and examined by the researcher. The data presented was supported by direct examples from the interviewees.

3. RESULTS

TABLE 2. Mann Whitney U-test results of pre-test scores of control and experimental groups in cognitive domain steps of achievement test

COGNITIVE DOMAIN LEVEL	GROUP	n	MEAN RANK	TOTAL RANK	U	Z	p
Pretest Remembering	Control	31	32,65	1008,00	451,00	-0,45	,656
	Experiment	31	31,56	956,00			
Pretest Understanding	Control	31	32,37	1000,60	457,50	-0,35	,730
	Experiment	31	31,02	953,50			
Pretest Applying	Control	31	30,85	960,00	465,50	-0,24	,817
	Experiment	31	32,05	986,50			
Pretest Analyzing	Control	31	31,32	963,00	472,50	-0,14	,895
	Experiment	31	32,06	986,00			
Pretest Evaluating	Control	31	31,16	965,00	467,00	-0,22	,829
	Experiment	31	31,86	992,00			
Pretest Creating	Control	31	32,65	1010,00	449,00	-0,62	,543
	Experiment	31	30,92	946,00			

When Table 2 is observed it is seen that achievement pre-test scores of groups in each dimension of cognitive domain; *remembering* (U = 451.00; p > .05), *understanding* (U = 457.50; p > .05), *applying* (U = 465.50; p > .05)), *analyzing* (U = 472.50; p > .05, *evaluating* (U = 467.00; p > .05) and *creating* (U = 449.00; p > .05) did not indicate any statistically significant difference. When the mean ranks and totals of groups are examined, it is seen that control group's achievement scores are higher in "remembering, understanding and creating" dimensions of pre-experimental cognitive domain and experimental group's scores are higher in "applying, analyzing and evaluating" dimensions.

TABLE 3. T-Test results of the achievement test pre-test total scores of control and experimental groups

COGNITIVE DOMAIN LEVEL	GROUP	n	x̄	S	sd	t	p
Pretest Total Score	Control	31	8,42	4,12	60	0,47	,645
	Experiment	31	8,12	3,73			

When Table 3 is observed, it is seen that the mean achievement pretest total scores of the control and experimental groups did not indicate a significant difference (t60) = 0.47; p > .05). However, it is seen that mean total achievement score of control group before the experiment (x̄=8.42) is higher than total mean score of experimental group (x̄=8.12).

TABLE 4. Mann Whitney U-test results of control and experimental groups' post-test scores in cognitive domain levels of achievement test

COGNITIVE DOMAIN LEVEL	GROUP	n	MEAN RANK	TOTAL RANK	U	Z	p
Posttest Remembering	Control	31	29,50	884,00	388,00	-1,34	,183
	Experiment	31	35,50	1069,00			
Posttest Understanding	Control	31	28,13	1000,60	373,50	-1,57	,119
	Experiment	31	34,99	953,50			
Posttest Applying	Control	31	27,47	869,00	356,50	-1,81	,072
	Experiment	31	35,65	1085,50			
Posttest Analyzing	Control	31	29,78	852,50	444,00	-0,55	,589
	Experiment	31	33,72	1110,00			
Posttest Evaluating	Control	31	29,14	940,00	403,00	-1,17	,244
	Experiment	31	35,02	1015,00			
Posttest Creating	Control	31	30,52	955,00	459,00	-0,32	,751
	Experiment	31	33,42	1000,00			
Posttest Total Score	**Control**	**31**	**28,98**	**873,00**	**377,00**	**-1,48**	**,141**
	Experiment	**31**	**34,96**	**1082,00**			

When Table 4 is examined no statistically significant difference was observed between achievement pre-test scores of groups in each dimension of cognitive domain remembering (U = 388.00; p > .05), understanding (U = 373.50; p > .05), applying (U = 356.50; p > .05)), analyzing (U = 444.00; p > .05, evaluating (U = 403.00; p > .05) and creating (U = 459.00; p > .05) and posttest total scores (U = 376.00; p > .05).

TABLE 5. T-test results of TCTT verbal A and B forms creativity total scores of control group students

GROUP	TEST TYPE AND DIMENSION	n	x̄	S	sd	t	p
Control	Verbal Fluency A Form	31	26,68	7,74	30	-1,99	,059
	Verbal Fluency B Form	31	29,89	11,37			
	Verbal Flexibility A From	31	17,31	5,73	30	-1,88	,078
	Verbal Flexibility B Form	31	19,06	6,37			
	Verbal Originality A From	31	15,78	5,45	30	-1,51	,156
	Verbal Originality B From	31	17,84	9,25			
	Verbal A Form. Total Score	**31**	**59,01**	**18,25**	**30**	**-1,97**	**,071**
	Verbal B Form. Total Score	**31**	**66,02**	**26,03**			

When Table 5 is examined, no statistically significant difference was observed among pretest-posttest fluency ((30) = −1,99; p > .05), flexibility (t(30) = −1,88; p > .05) and originality scores and mean scores (t(30) = −1,51; p > .05) and total scores (t(30) = −1,97; p > .05) of control group. When the mean scores of the TCTT Verbal A and B forms dimensions of the control group are examined, it is seen that posttest mean scores are higher than pretest mean scores considering all mean scores. Likewise, the control group's post-test mean scores (x̄=66,02) were higher than the pre-test mean scores (x̄=59,01).

TABLE 6. T-test results of TCTT Verbal A and B forms creativity total scores of the experimental group students

GROUP	TEST TYPE AND DIMENSION	n	x̄	S	sd	t	p
Experiment	Verbal A FormFluency	31	27,02	12,65	30	-7,86	,000*
	Verbal B FormFluency	31	41,38	16,94			
	Verbal A FormFlexibility	31	17,03	6,78	30	-7,92	,000*
	Verbal B FormFlexibility	31	24,98	7,02			
	Verbal A FormOriginality	31	15,12	7,74	30	-8,35	,000*
	Verbal B FormOriginality	31	31,02	13,99			
	Verbal A FormTotal Puan	**31**	**58,35**	**25,85**	**30**	**-8,83**	**,000***
	Verbal B FormTotal Puan	**31**	**97,06**	**36,96**			

When Table 6 is examined, statistically significant difference was observed between the pretest-posttest fluency ((30) = −7,86; p< .05), flexibility (t(30) = −7,92; p< .05) and originality scores of experimental group and the mean scores (t(30) = −8,35; p < .05) of their total scores (t(30) = −8,83; p < .05).

TABLE 7. T-test results of the mean scores of the control and experimental groups in each dimension of the TCTT verbal A form and the total creativity scores

TEST TYPE AND DIMENSION	GROUPS	n	x̄	S	sd	t	p
Verbal A Form	Control	31	26,68	7,74	60	-0,07	,990
Fluency	Experiment	31	27,02	12,65			
Verbal A Form	Control	31	17,31	5,73	60	0,25	,843
Flexibility	Experiment	31	17,03	6,78			
Verbal A Form	Control	31	15,78	5,45	60	0,56	,634
Originality	Experiment	31	15,12	7,74			
Verbal A Form	**Control**	**31**	**59,01**	**18,25**	**60**	**0,21**	**,872**
Total Puan	**Experiment**	**31**	**58,35**	**25,85**			

When Table 7 is examined, it is seen that the control and experimental groups' TCTT pre-test fluency ((60) = −0,07; p > .05), flexibility (t(60) = 0,25; p > .05) and originality (t(60) = 0,56; p > .05) and total scores (t(60) = 0,21; p > .05) mean that there is no statistically significant difference. When the averages of the creativity pre-test scores of the groups are examined, it is understood that the averages of both groups in all dimensions and total scores are close to each other.

TABLE 8. T-test results of the mean scores of the control and experimental groups in each dimension of the TCTT verbal B form and the total creativity scores

TEST TYPE AND DIMENSION	GROUPS	n	x̄	S	sd	t	p
Verbal B Form	Control	31	29,9	11,37	60	-3,19	,003*
Fluency	Experiment	31	41,38	16,94			
Verbal B Form	Control	31	19,06	6,37	60	-3,80	,000*
Flexibility	Experiment	31	24,98	7,02			
Verbal B Form	Control	31	17,84	9,25	60	-4,36	,000*
Originality	Experiment	31	31,02	13,99			
Verbal B FormΩ	**Control**	**31**	**66,02**	**26,03**	**60**	**-3.81**	**,000***
Total Puan	**Experiment**	**31**	**97,06**	**36,96**			

When Table 8 is examined, considering the control and experimental groups' TCTT posttest fluency ((60) = −3,19; $p < .05$), flexibility ($t(60) = -3{,}80$; $p < .05$) and originality ($t(60) = -4{,}36$; $p < .05$) and total mean scores ($t(60) = -3{,}81$; $p < .05$) it is seen that there is a statistically significant difference. When the posttest mean scores of the control and experimental groups are examined, the mean scores in all dimensions of the creativity test differ on behalf of experimental group.

TABLE 9. ANOVA results of the mean scores of the experimental group from the teacher observation form in the digital game creation process

VARIABLE	n	x̄	ss	sd	F	p	TUKEY
Activity							
(1) Before the Activity	31	9,03	4,52	30	5,46	,001*	1-2
(2) During the Activity	31	11,12	3,56				1-3
(3) After the Activity	31	13,43	2,98				2-3

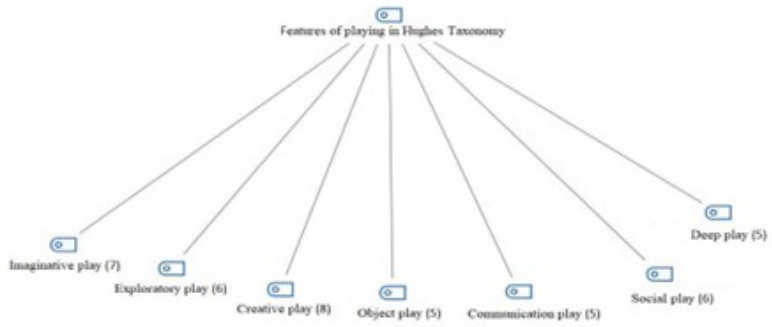
When Table 9 is examined, it is seen that there is a significant difference in experimental group's before, during and after the experiment total scores of the teacher observation form ($F(30) = 5.46$, $p < .05$). Post-hoc tests were conducted to observe this difference. As a result of Tukey test, there is a difference in the total scores at each stage of the activities according to the teacher's observation.

FIGURE 5. Contribution of digital games developed to apply in history teaching to the development of digital game principles

According to students' opinions, the effect of digital games developed in the teaching of history subjects in social studies course on the development of digital game principles was indicated through seven codes. According to this, the students stated the effect of digital games developed in the teaching of history subjects in social studies course on the development of digital game principles each of the codes of inspiration, attention, and satisfaction 6 times, they stated each of the codes of personification, gamification, relevance and confidence 5 times (see Figure 5).

S12 "The activities we did together with my teacher during the process attracted my attention a lot. I love playing games on the computer anyway. As a result, my attention to the lesson and the activities increased."

FIGURE 6. The effect of digital games developed to apply in history teaching on the development of game types

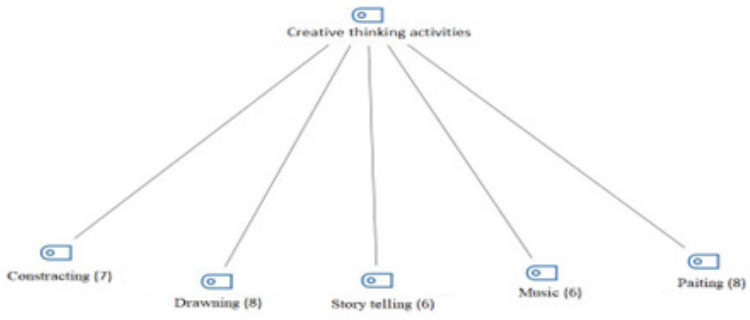


According to student opinions, the effect of digital games developed in teaching of history subjects in social studies course on the development of Hughes Taxonomy (2002) game types was indicated via seven codes.

According to this, students stated the effect of digital games developed in teaching of history subjects in social studies course on the development of digital game genres 6 times for exploratory and social play codes, creative play 8, imaginative play 7 and they stated each of the object, deep and communication play codes 5 times (see Figure 6).

S9 "In social studies course, our teacher made us play games about history. But I love games with objects like building blocks. If it is done in other lessons, I will tell our teacher to make such games."

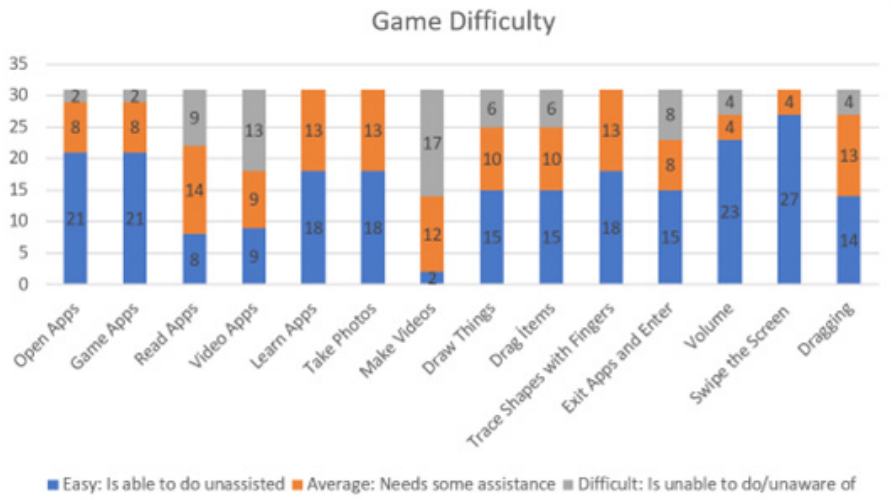
FIGURE 7. The effect of digital games developed to apply in history teaching on the development of creative thinking activity



According to students' opinions, the effect of digital games developed in teaching of history subjects in social studies course on the development of creative thinking activities was indicated via five codes. According to this, students stated each of the drawing and painting codes 8 times, constructing 7 times, they stated each of the storytelling and music codes 8 times (see Figure 7).

> S31 "I always tell my father that I will study computer and software engineering when I grow up. I say that after I become an engineer, I will make and sell games. I thought that I got this opportunity my social studies class. I told my teacher that I could do it myself not to interfere with me. My teacher was surprised but appreciated me. Every aspect of digital game creation has impressed me. When I grow up, if I become a computer and software engineer, I will not forget that these activities made a first impression on me."

FIGURE 8. Difficulties encountered in digital game steps developed to apply in history teaching



It is seen that students have difficulties in the process of creating videos, mostly with video and writing applications, in the process of creating digital games developed for learning history topics in social studies course. They had no difficulty in drawing shapes, sound, screen scrolling, opening the application. It is seen that they did it by dragging and helping the application in reading (see Figure 8).

4. DISCUSSION

The first two questions of the research focused on the effect of digital games on the academic achievement of students in teaching of history subjects in social studies course. According to the results obtained in this context, the academic achievements of the groups before the experiment indicate similarities with each other. In the achievement test after the experiment, it was concluded that the scores between groups differed on behalf of experimental group. According to form Chen studies (Chen & Law, 2016; Kangas et al., 2017; Makar et al., 2015; Van de Pol et al., 2010), it was found that digital games have a significant effect on student academic achievement and lessons form an important framework. In small group studies, it was determined that digital games increase students' academic achievement (Makar et al., 2015). In addition

students' taking the leading role by creating digital games had a considerable effect on increasing the achievement of the course. Students can solve a given problem individually with digital games, recognize the difficulties and offer suggestions. This situation increases the student's achievement and interest in the lesson (Muhonen et al., 2016; Nousiainen et al., 2018). As a result, digital games create a process of creating a structure that supports students by interacting with students in the process and under the guidance of the teacher. When the structure of the course process takes on this dimension, it will be inevitable to increase the course achievement of the student (Nousiainen et al., 2018; Watson et al. 2011). Banihashem and others (2023) emphasize the importance of game-based learning (GBL) for educators to monitor the effectiveness of learning, identify gaps in learning during the game, and provide appropriate interventions to enhance learning quality. Additionally, GBL enables a better representation of the relationship between learning goals. Noroozi (2018) conducted a study that focused on how higher education students with various epistemic beliefs engage in discussions within a digital dialogue game and how their attitudes are influenced. The study observed that the digital dialogue game could guide students towards the desired mode of interaction and discussion, and it was noted to be a significant factor in the attitudinal changes related to their epistemic beliefs. Additionally, students' epistemic beliefs influenced the style and frequency of a specific type of argumentative dialogue. Students with multiple perspectives participated in argumentative dialogue activities differently compared to evaluators. Dehghanzadeh et al. (2021) argues that digital gamification is a fun and enjoyable method to support learning English as a Second Language (LESL) and alleviate the gap between students' learning and educational applications. Furthermore, through gamification, students engage with LESL while mapping their learning experiences and outcomes. While positive effects of gamification on learners' learning experiences and outcomes have been reported in these studies, none of the publications specify gamification elements associated with learning experiences and outcomes. Being enjoyable, engaging, motivating, and fun are the targeted learning outcomes of gamified LESL in terms of language acquisition, participation, motivation, and satisfaction. Noroozi (2017) investigated how undergraduate students engaged in discursive discourse activities designed to intensify discussion in a digital dialogue game. The research findings suggest that the digital dialogue game can facilitate discussion-based learning. From the students' perspectives, the digital dialogue game was positively evaluated in terms of satisfaction and learning experiences.

The third and fourth questions of the research focused on the effect of digital games on students' creative thinking skills in teaching of history subjects in social studies course. According to the results obtained in this context, it is similar to creative thinking skill test before the intergroup experiment. In the creative thinking test performed after the experiment, it was concluded that there was a difference in the scores between the groups on behalf of the experimental group. The fifth question of the research focused on the change of the student according to the teacher observation form before, during and after the activity of the digital games designed in teaching of history subjects in social studies course. According to the results obtained in this context students' observation scores before, during and after the activity differ in the digital game design process. It was seen that students' creative thinking skills and learning situations are different in the courses in which the digital games chosen by the teachers are applied. In terms of interpreting digital games in the context of pedagogical principles, it encourages students to develop skills such as creativity, collaboration and critical thinking (Tropper et al., 2015). Digital games take the student out of traditional classroom environment and bring them to the real world. This provides the opportunity to increase student

creativity and sense of research more. However, teachers need to know more and do more research on how to design digital games with creative components to enhance students' creativity (Sun et al., 2021).

The results for the six, seven and eight questions of the study were found by taking the opinions of experimental group students. Questions directed to students focused on the effects of the design process of digital games on digital game principles, digital game genres and creative thinking activities. The ninth question of the research focused on the difficulties faced by students in designing digital games to be used in history teaching. Students will be able to learn the effects of digital games developed in teaching of history subjects in social studies course on the development of digital game principles, inspiration, attention, satisfaction, personification, gamification, relevance and confidence. Students learn the effects of digital games developed in teaching of history subjects in social studies course on the development of game genres; creative, imaginative, exploratory, social, object, deep and communicative play. Students learn the effect of digital games developed in teaching of history subjects in social studies course on the development of creative thinking activities, drawing, painting, creating, storytelling and music. At the stage of creating the digital games developed for learning history subjects in the social studies lesson, the students stated that they had difficulties in the process of creating videos with video and writing applications, they did not have difficulty in drawing shapes, sound, screen scrolling, opening the application, and they did it by dragging and helping in reading the application. The pedagogical principles of digital game-based learning applications encourage students for the basic elements of digital game such as fantasy, curiosity and challenge in the context of creativity, problem solving, and critical thinking (Tropper et al., 2015). In the context of creativity, if the components of digital games are combined with social studies subjects, the course becomes more interesting. Digital games designed based on the components of digital games in education strengthen students' creative thinking, problem solving and interaction skills. However, more studies are needed to understand this situation better (Behnamnia et al., 2020; Grammenos & Antona, 2018; Meletiou-Mavrotheris & Prodromou, 2016). While designing digital games, teachers must try to understand how the student's creativity develops while using the game. For students to actively take part in the digital game process, they need to have technology and related skills. Digital games that encourage creativity must be designed within the framework of principles that will improve student creativity. Digital games designed for this purpose make learning easier and more effective by putting the classroom atmosphere into a different dimension (Barzilai & Blau, 2014; Gong, 2020). Digital games with creative components will help students to have fun, learn and interact. In addition to improving learning, it will improve the student's ability to cooperate (Muhonen et al., 2016; Sun et al., 2021).

The findings of the current research indicate that digital games must add some practical features to the games according to the purpose of education in order to encourage academic achievement and creativity. It must be noticed that higher quality digital games will be a key factor in improving students' achievement and creativity. It is important that digital games make some changes at the secondary school level when applying them to the subjects in the curriculum. Considering that students take part more in the entertainment and creative activities of the lessons taught with digital games, teachers must consider the level of difficulty in teaching the subject. In this case, the student can focus more on developing creativity and learning. More research is needed for educational digital game applications since digital games have been developed in all areas of life recently (Bakker et al., 2016; Drijvers et al., 2014; Rienties et al., 2012).

4.1. Limitations and Future research

This study revealed meaningful outcomes in terms of student academic achievement and creativity in the context of teaching history topics using digital-based games in social studies classes; however, assessing general dependency information in a single study is impossible. There are some limitations in this study that pave the way for future research. The limitations of our study are as follows: Firstly, all participants were from the same city and limited to one middle school, so they may have similar behavior attitudes. Secondly, other personal factors or environmental conditions, such as academic performance and creative thinking, may affect levels of dependency. For future studies, obtaining better information about the academic achievement and creativity levels of students with digital games with wider sampling groups and independent variables will be helpful.

5. CONCLUSIONS

The purpose of this research is to investigate the effect of digital games on student academic achievement and creative thinking in the teaching of history subjects in social studies course. The data of the research was collected using the mixed method model. The research suggests that digital game development process in the social studies course, increase students' academic achievement and encourage them to develop creative thinking. In addition, the relationship between digital game components and creativity was investigated. Digital games are discussed in the context of digital game principles in developing creativity. In the research, the role of teachers in this process was also mentioned for digital games to strengthen students' academic achievement and creativity. Because teachers, who are at the center of education, have a key role in increasing students' learning, creative thinking and motivation. In addition, the teacher empowers students to face problems in the real world and helps them understand the problems and challenges of digital games. This research might have a significant impact on students being more creative in solving future life problems. In addition, it offers an important perspective to digital game designers and researchers working in this field. The research offers important suggestions on how to improve achievement and creative thinking, and how to motivate learning outcomes by taking support from digital games in the teaching of history subjects in social studies course.

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