Exploring the Effect of Video Games on Gifted Children's Spatial Orientation and Entrepreneurial Skills

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Abstract

The present study aimed to examine the effect of video games on gifted children's spatial orientation and entrepreneurial skills. An embedded mixed methods design was utilized to conduct the study. A randomized control group design was used in the quantitative part of the research, and a case study design was used in the qualitative part. The study was conducted with 21 volunteer secondary school students receiving supportive education at a science and art center. The experimental group comprised 10 students while the control group included 11 students. The data were collected through "Spatial Orientation Test", "Entrepreneurship Scale for Secondary School Students", and "Weekly Progress Form". Additionally, the game profiles and career progress of each student were photographed at the end of each session. The students in the experimental group played the Euro Truck Simulator 2 video game for six weeks. No statistically significant difference was found between the pre-test and post-test scores of the gifted children in the experimental and control groups. Furthermore, no statistically significant difference was not found between pre-test and post-test scores of the gifted children in the experimental group. These results show that the activities undertaken in the experimental and control groups did not lead to a significant difference in the spatial orientation and entrepreneurial skills of the gifted students. Qualitative findings revealed that gifted children mostly preferred to save the money they earn, did not take risks and preferred to carry products with low-risk transportation. These results show that risk-taking sub-behavior, which is one of the most important indicators of entrepreneurial skill, was not shown. It is seen that the quantitative findings were supported by the qualitative findings. Further research might examine the effect of increasingly challenging non-routine tasks that enable gifted children to fulfill their true potential on their entrepreneurial and spatial skills and results can be compared.

Keywords: *Gifted children, Spatial orientation, Entrepreneurship, Video games, Skills training*

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INTRODUCTION

When talking about anything that has happened or is about to happen, people must necessarily communicate the three basic elements. They are space, time, and events. Among them, space is the most intriguing and undisputed element. Therefore, people want to know and be informed about space. Space may sometimes be a geometric shape, sometimes be a photo frame, and sometimes be a public building. A sheer volume of scientific research has investigated and tried to explain space, which is a matter of great curiosity (Aladağ et al., 2021; Clements, 1998; Ekstrom et al., 1976; Güneş et al., 2020; Hawes et al., 2022; Hegarty et al., 2002; Hodgkiss et al., 2018; Linn & Petersen, 1985; Sorby, 2009; Şanlı, 2020; Uttal et al., 2013).

Skills to understand and interpret space and orientate oneself in space are called spatial skills. Having spatial skills is considered an integral part of learning (Kell et al., 2013). Studies have found a strong correlation between spatial skills and achievement in Science, Technology, Engineering, Mathematics (STEM) (Buckley et al., 2018; Wai et al., 2009). A strong connection is also present between spatial skills and other disciplines such as social studies (Newcombe, 2013). It is well-established that spatial skills are important for scientific progress because they are inherently connected with people's creative skills. Developments such as 3D transistors, nano-architecture, agile robots, self-healing polymers, DNA origami, and the design and manufacture of 3D structures rely heavily on the spatial skills of their inventors (Gold et al., 2018, p. 668; Wai & Worrell, 2015).

Despite differing views (Carroll, 1993; Hegarty et al., 2006; McGee, 1979; Linn & Petersen, 1985; Lohman, 1979; Lohman, 1988; Uttal et al., 2013), it is generally agreed that spatial skills involve spatial orientation, spatial visualization, and mental rotation (Ramful et al., 2017). Spatial orientation refers to the ability to know one's position in space, adjust one's position according to spatial elements, and navigate by oneself or using various tools such as maps or navigation applications. Spatial orientation is one of the abilities, which is most likely to be developed through practice in educational settings.

Although spatial orientation or spatial skills, in general, are critically important, they are most often neglected by educators (Mathewson, 1999). Considering the potential benefits, it is of utmost importance to develop children's spatial orientation. Especially in low- and middle-income countries, spatial skills training can unlock and develop children's creativity and potential (Borzekowski et al., 2022). Spatial orientation and spatial anxiety in children may differ depending on gender. Boys may have greater spatial orientation and less spatial anxiety because they spend more time outdoors and travel longer distances compared to girls (Gold et al., 2018; Vieites et al., 2020). However, even for children, sometimes it may be costly to travel and have spatial experiences in the real world. Therefore, virtual environments can be used to reduce costs, minimize security problems, and eliminate gender differences.

Besides, it is inevitable for countries to maintain their economic development and have a competitive power so that they can keep up with the rapidly changing and developing world economy. The core components of competitive power are entrepreneurs, that is, individuals who are creative, have high self-confidence and the courage to innovate, and can act on their own initiative and take risks (Aladağ, 2017). Effective entrepreneurship education can improve personal well-being and it can, on a larger scale, affect the country's economy and sustainable development goals (Afolabi et al., 2017). Although entrepreneurial skills are innate, they can be improved as far as environmental factors allow (İkiz et al., 2015). Researchers note that people with entrepreneurial skills have some common skills. Iredale (1993) listed the basic skills that entrepreneurial people have as follows: higher motivation and self-confidence, greater independence and responsibility, more creativity and flexibility in thought and action, better resource management, better problem-solving and decision-making, and greater ability to take initiative, grasp opportunities, cope with failure, and measure risks. According to Wongphuka et al. (2017), the basic skills of social entrepreneurs include management, networking, fundraising, communication, teamwork, learning, marketing, and reporting and evaluating.

Like many other skills, entrepreneurship and spatial orientation are skills that should be acquired and developed at an early age. Heinz (2002) notes that personal and family experiences in early life play an important role in future failure and success. Thus, the Social Studies Curriculum introduced by the

Ministry of National Education in 2005 is aimed at helping students acquire spatial perception, map reading skills, location analysis, and entrepreneurial skills at an early age (Ministry of National Education, 2005). These skills share a common ground: they are interdisciplinary, they form the basis for other skills and values, and they are directly but mostly implicitly included in the curriculum. Therefore, many studies have found that entrepreneurship and spatial orientation are strongly linked with both academic and professional success (Halpern, 2000; Jardim, 2021; Wai et al., 2009). In other words, the acquisition of these skills is of critical importance for success in social life. However, teaching these skills is beset with some problems. Despite their importance, spatial and entrepreneurial skills cannot be given enough time in the classroom, and teachers have difficulty building these skills (Borzekowski et al., 2022; Yurtseven & Ergün, 2018).

Gaining spatial and entrepreneurial skills from an early age is critical and these skills need to be supported in learning environments (Rodrigues et al., 2012; Soluki et al., 2021). Because in order to provide an effective learning environment, both skills must be benefitted. Entrepreneurial activities are largely based on spatial skills. Entrepreneurial students often need spatial skills when thinking about a subject, generating an idea, visualizing the idea in their mind, presenting this idea to others with graphics, reading and interpreting tables, and solving the problems they encounter (Bresciani & Eppler, 2013; Hayati & Umer, 2018; Stylianou, 2002). Therefore, in the present study, the spatial and entrepreneurial skills of gifted children were examined together.

Gifted Children and Skills Training

According to DeHaan and Havighurst (1961), giftedness consists of six basic components: intellectual ability, creative thinking, scientific ability, social leadership, mechanical skills, and talent in fine arts. Various definitions have been offered to emphasize the different characteristics of giftedness. These definitions generally give importance to the acquisition of intellectual giftedness in a particular area or subcategory. Giftedness is oversimplified because it is usually associated only with intelligence quotient (IQ); however, the relationship between mental age and chronological age is an important indicator of giftedness (Gross, 1993). Gifted children typically have a high level of cognitive ability; thus, having an above-average IQ is considered a typical feature of giftedness (Marland, 1972). Although there are various indicators for detecting giftedness (teacher and parent observation of children's behavior and development, school success, etc.), measuring IQ is the only widely accepted method for identifying gifted children (Vaivre-Douret, 2011).

Giftedness is categorized in various ways depending on IQ scores. For example, Silverman (1989), reported that children who score three standard deviations above the mean on a cognitive ability test should be called "highly gifted" and these children have an IQ of 145 or above. Children who have an IQ of 160 to 179 are called "exceptionally gifted" (Kline & Meckstroth, 1985), and rare individuals with an IQ of 180 or above are called "profoundly gifted" (Sattler, 2001). Wood and Laycraft (2020) merge these categories and call children with an IQ of 145 and above "highly profoundly gifted".

Gifted children have different advantages or disadvantages depending on their cognitive, affective, and social abilities. For example, exceptionally gifted children may be extraordinarily gifted compared to their peers in abstract thinking and hypothesis construction while they may lack the ability to organize any material, present a proof, or coordinate a written text (Lovecky, 1994). Researchers note that gifted children may have serious problems with their perception of social relations. For example, gifted children who are faced with serious bullying may choose to withdraw from social interaction, act hostile/sarcastic, or tend to be violent (Tolan, 2018). The size of the problem that gifted people experience in social relations may also vary depending on the level of giftedness. For instance, profoundly gifted children may have more difficulty in social relations than moderately gifted children (Assouline et al., 2009).

Spatial skills are rarely measured and generally ignored in gifted education (Andersen, 2014). Failure to discover the characteristics of gifted children and provide the right education at the right time may lead to irreparable losses for society. Education policies usually focus on discovering the common abilities of the majority and fail to ably support gifted children, thereby causing gifted children to be neglected, fail, and get bored with education (Altıntaş & İlgün, 2016; Kroesbergen et al., 2016). Besides, the perception that "gifted children can learn on their own without help" may cause their educational

needs to remain unsatisfied; thus, gifted children may never fulfill their true potential. If teachers lack information or have misinformation about the characteristics of gifted children, it is also problematic for gifted children (Akar & Akar, 2012). When gifted children are not guided to attend special schools for gifted children or out-of-school gifted programs, they are deprived of gifted education. There is a clear need to use alternative ways that consider the interests, desires, and abilities of gifted children to ensure that gifted children can unlock their full potential. Games can be defined as physical, mental and emotional activities performed individually or together to have a good time (Toprakçı, 2017). In real life, as the games are used in education, as the researchers stated that simulation video games can be used for two reasons. First, video games have today become an important entertainment and leisure activity for almost all children and adolescents (Granic et al., 2014; Kuss & Griffiths, 2012; Yılmaz et al., 2022a). Besides, the new generation of video games offers more realistic content to users and entertains players while providing informative content and developing skills, thereby making video games more advantageous compared to many other methods (Di & Zheng, 2022; Wauck, 2020).

Simulation Games and Skills Training

Although there is no consensus on the definition of simulation video games, these games mainly simulate real-life situations in various fields such as sports, economics, and building and are aimed to entertain players while providing them with certain knowledge and skills (Braun et al., 2016; Dorn, 1989). Players in simulation games can develop their different skills while learning can take place. Earlier studies have shown that simulation video games improve players' skills in solving social/unstructured problems (Yılmaz et al., 2022b) and mathematical/structured problems (Liu et al., 2011). Simulation video games also contribute positively to academic achievement (Adeyemi & Ajibade, 2011; Bilesanmi Awoderu, 2006) and help children to have a positive attitude towards rules (e.g., traffic rules) and abide by rules (Renaud & Suissa, 1989). Simulation video games used in education help overcome students' motivation problems (Günüç & Yılmaz, 2021).

Simulation games allow players to design, develop, and execute their designs, thereby systematically supporting their motivation and creativity, which are critical for generating innovative ideas (Burdon & Munro, 2017). In cases where access to materials or learning environments is expensive, takes a long time, or is impossible for some reason, simulation games provide players with the opportunity to indirectly experience at least some of these situations (Greenblat, 1973). The benefits of simulation video games may differ depending on the characteristics of players and the extent to which they reflect real-life situations (e.g., some simulation video games slightly resemble real-life situations (Peters & Vissers, 2004).

Current Research and Euro Truck Simulator 2 (ETS 2)

The literature includes studies investigating the effects of simulation games on children's various cognitive, affective, and psychomotor skills. However, to the best of the authors' knowledge, no study has so far investigated gifted children's spatial orientation and entrepreneurship. Besides, research on gifted students' spatial skills has generally focused on spatial visualization and mental rotation. There are few studies examining gifted students' spatial orientation skills (Chan, 2007). Considering numerical, verbal, and spatial symbolic systems, spatial skills should be taken into account in gifted education (Wai & Worrell, 2015). Against this background, the purpose of this research was to examine the effect of the simulation video game "Euro Truck Simulator 2 (ETS 2)" on gifted students' spatial orientation and entrepreneurial skills.

ETS 2 has become increasingly complicated as a result of several updates. The game offers several alternatives where you can travel around European cities with a truck, get many job offers, and start your own business as you earn money. Therefore, it is thought that the game is likely to have an impact on spatial and entrepreneurial skills. Within the framework of the game dynamics, players aim to pick up a load from a certain location with a truck and deliver it to a designated location in the shortest amount of time through the most suitable route to make the most money. When choosing a load, players should consider the distance, the price per kilometer, and the sensitivity of the load. The game also comprises navigation applications with various maps and graphics. Players can use these navigation applications during the journey. They can increase the money that they earn by parking their vehicles in a particular way at a certain place while loading and unloading. Players must constantly orient the positions of their

own vehicles relative to other vehicles not to have a traffic accident during the journey. Players can use their earnings as they wish. For example, they can save up or take bank loans to buy a truck or set up a company. In this case, their gains and losses (e.g., accidents, traffic fines, etc.) increase in parallel with their increased responsibility.

METHOD

Research Design

A concurrent nested design, one of the mixed method designs, was utilized to conduct the present study. The concurrent nested design involves collecting and analyzing qualitative data as a secondary dataset in relation to quantitative data (Creswell & Plano Clark, 2011). A randomized pre-test-post-test control group design was used in the quantitative part of the study (Cohen et al., 2011; Fraenkel et al., 2011). The career progress of the students in the game was photographed throughout the study to gather qualitative data, and the students filled out a "Weekly Progress Form" each week.

Study Group

33 gifted children (aged between 10 to 13 years old) who had supportive education at the science and art center (BILSEM in Turkish acronym) and had parental permission volunteered to participate in the present study. 18 of them were randomly assigned to the experimental group and the rest of them (15 students) were assigned to the control group. However, due to the COVID-19 pandemic, compulsory attendance was suspended for science and art centers and thus, because of the COVID-19 pandemic or other reasons, some students could not participate in the whole experimental procedure. Consequently, the experimental group was composed of 10 students (six boys, M_{age}=11.2 years old) who participated in the whole six weeks, while the control group was composed of 11 students (seven boys, M_{age}=11.4 years old) who attended the school throughout the implementation process.

Data Collection Instruments

The data were collected using the "Spatial Orientation Test", "Entrepreneurship Scale for Secondary School Students", and "Weekly Progress Form". Additionally, the game profiles and career progress of each student were photographed at the end of each session throughout the experimental procedure. These photos were used to examine the variables such as balance, the number of deliveries finished, the number of deliveries cancelled, the number of trucks, the percentage of roads explored, the number of trailers owned, and the number of garages owned.

The Spatial Orientation Test (SOT) was used to determine the development of students' spatial skills. SOT was developed by Kösa and Kalay (2018) for 7th-grade secondary school students. SOT consists of 20 multiple-choice items. Correct answers are scored as 1 point, while incorrect answers and unanswered questions are scored as 0 (zero). SOT consists of two factors: one 13-item factor related to the appearance of polycubes, and one 7-item factor related to the knowledge of the location and direction relative to one's position. The Cronbach's alpha coefficient of the original test was found to be 0.85, while it was computed as 0.74 in the present research. A Cronbach's alpha coefficient above 0.70 is an indicator that measurements are reliable (Nunnally, 1978).

The Entrepreneurship Scale for Secondary School Students (ESSSS) was used to measure students' entrepreneurship levels. The scale was developed by Eroğlu et al. (2020). It consists of 31 items rated on a 4-point Likert-type scale ranging from "strongly disagree" to "strongly agree". The total score ranges from 31 to 124. ESSSS consists of three subscales: self-awareness (13 items), taking risks (11 items), and taking opportunities (7 items). The Cronbach's alpha coefficient of the original ESSSS was found .90 for the entire scale, 0.88 for the self-awareness and taking risks subscales, and 0.76 for the taking opportunities subscale. The fit indices used to test the construct validity of the scale was found as follows: X^2/df = 1.41, RMSEA = 0.042, NFI = 0.89, NNFI = 0.96, CFI = 0.93, GFI = 0.93, and AGFI = 0.83. The validity and reliability of the scale were also tested in the present research. In this context, ESSSS was administered to 124 gifted students. After outliers in the dataset were detected using Z-score, confirmatory factor analysis and reliability analysis were performed for the dataset gathered from 116 participants. The Cronbach's alpha coefficient was computed as "*.90*" for the entire scale, "*.80*" for the

self-awareness subscale, "*.89*" for the taking risks subscale, and "*.73*" for the taking opportunities subscale. The confirmatory factor analysis results showed that the path coefficients for all items are significant and the standardized path coefficients range from 0.31 to 0.82. The fit indices were computed as follows: X^2/df = 1.40, RMSEA = 0.059, NFI = 0.85, NNFI = 0.95, CFI = 0.95, GFI = 0.72, and AGFI = 0.68. The fit indices were compared with the reference values. The X^2/df, RMSEA, NFI, NNFI, and CFI values showed excellent and good fit (Hu & Bentler, 1999, Tabachnick & Fidell, 2013), while GFI and AGFI indicated poor fit. However, the model-data fit was considered satisfactory for the sample of gifted secondary school students because GFI and AGFI are influenced by the sample size and tend to increase as the sample size increases (Anderson & Gerbing, 1984; Marsh et al., 1988). Accordingly, ESSSS was considered suitable for use for gifted students.

The weekly progress form was developed by the researchers. Expert opinion was taken from two subject-matter experts and two measurement and evaluation experts. The final version of the form was administered only to the experimental group at the end of each session of the six-week experimental procedure. The Weekly Progress Form consisted of questions such as which task students chose, what they paid attention to when choosing a task, how much they earned from the task, and how they spent the money.

Experimental Procedure

After having ethical approval from Aydın Adnan Menderes University Educational Research Ethics Committee, the experimental implementation process was planned with the school administration. During the pre-test, the SOT and ESSSS were completed by both experimental and control groups. Then an orientation session was held with the experimental group for two hours. During this session, the students were informed about how to create an ETS 2 account, how to play the game, and how to use the keyboard and mouse. They were also given an information sheet explaining the functions of keyboard keys in each weekly session. After the students were introduced to the game, they started exploring the game, created their accounts and profiles, and completed their first tasks for an hour. The experimental procedure had to be limited to two hours per week and six weeks in total for three reasons. First, although parents were informed about the video games used (simulation games), their prejudices towards videogames prevented the longer time implementations. Second, since the students in the experimental group attended their own schools during the weekdays, the implementations could only be carried out on weekends (saturday) during science and art center hours. This has limited the days on which the implementations can be made. The last reason was the busy school (BILSEM) schedule of the students and the need for use of school computers, on which games were played, by teachers during the teaching. Therefore, the implementation process was carried out six weeks after the orientation week. The students played ETS 2 two hours a week during the six-week period, trying to progress in their chosen tasks and develop the companies that they founded. The researchers held each weekly session of the experimental procedure and adjusted the game settings for variables that were not planned to be measured in the research. In this regard, the game settings were changed to switch off climate and weather modes such as rain, heavy fog, and darkness, traffic fines, and fatigue simulation. The students filled in the Weekly Progress Form every week during the experimental procedure. Additionally, the ETS 2 career and profile pages of each student were photographed by the researchers at the end of each session. SOT and ESSSS were administered as post-tests one week after the six-week experimental procedure. The control group had their usual supportive education courses at the science and art center during the process.

Data Analysis

In the quantitative part of the research based on a randomized pre-test-post-test control group design, the significance of within-group and between-group differences in the pre-test and post-test scores on SOT and ESSSS were analyzed. To this end, first, the assumptions of normality and homogeneity of variance were tested for the independent-samples t-test and paired-samples t-test. Table 1 shows the statistics on the assumptions of normality.

Table 1. *Statistics on the assumption of normality*

Groups	Tests	Instruments	Shapiro-Wilk p	Skewness/Standard Error of Skewness	Kurtosis/Standard Error of Kurtosis
Experimental	Pre-test	SOT	0.410	0.487	-0.735
		ESSSS	0.433	0.480	-1.020
	Post-test	SOT	0.000*	3.790	5.570
		ESSSS	0.190	1.880	1.279
Control	Pre-test	SOT	0.010*	-2.245	1.244
		ESSSS	0.354	-0.539	-0.627
	Post-test	SOT	0.692	0.743	0.565
		ESSSS	0.050	-2.395	2.657

*p<.05

As seen in Table 1, the SOT post-test data of the experimental group and the SOT pre-test data of the control group were not normally distributed according to the Shapiro-Wilk test results ($p < 0.05$) and the standardized values of skewness and kurtosis. Additionally, according to the ratio of skewness and kurtosis to their standard errors, the ESSSS post-test data of the control group were not within the ±1.96 range at a 95% confidence level. Table 2 shows the statistics on the assumptions of homogeneity of variance.

Table 2. *Statistics on the assumption of homogeneity of variance*

Type of Comparison	Tests	Instruments	Levene's test	df1	df2	p
Experimental- Control	Pre-test	SOT	0.148	1	20	0.704
		ESSSS	0.187	1	20	0.670
Experimental- Control	Post-test	SOT	0.535	1	20	0.473
		ESSSS	8.916	1	20	0.007*
Type of Comparison	Groups	Instruments	Levene's test	df1	df2	p
Pre-test-Post-test	Experimental	SOT	2.005	1	18	0.174
	Experimental	ESSSS	2.546	1	18	0.128

*p < .05, df = degree of freedom

The variances are not homogeneous for the ESSSS post-test (Table 2). Given that the statistical assumptions were not satisfied in some groups and the number of students in the experimental and control groups was smaller than 20, the Wilcoxon signed-rank and Mann- Whitney U tests were used to interpret the data.

Students' responses to weekly progression forms, weekly game career progressions, and photos of game profiles were analyzed through document review. It was aimed to increase the reliability and validity of the findings obtained by making data triangulation. In the weekly progress form, it was questioned which tasks the students chose and why, how much money they earned/lost from the chosen task and how they spent the money they earned were interpreted. The data regarding weekly balances, percentages of roads discovered, number of completed and cancelled deliveries of gifted students were reached from the photographs of their weekly career progression and profiles, and other variables such as number of semi-truck, trailers, garages and drivers (employed) were obtained through photographs. The data coded into Microsoft Excel were interpreted by calculating the frequencies.

FINDINGS

1. *Quantitative Findings on Spatial Orientation*

1.1. Pre-test: Table 3 shows the Mann-Whitney U test results for the SOT pre-test scores of the experimental and control groups.

Table 3. *Mann-Whitney U Test results for SOT pre-test scores*

Groups	N	Mean Rank	Sum of Ranks	U	Z	p
Experimental	10	10.50	105.00	50.00	-0.357	0.721
Control	11	11.45	126.00			

The Mann-Whitney U test which was used to assess the significance of the difference between the experimental and control groups in their SOT pre-test scores, the U-value was 50.00 and the p-value was

0.721. The p-value greater than 0.05 indicates that there is no significant difference between the experimental and control groups in their SOT pre-test scores. In other words, it can be said that the experimental and control groups had similar levels of spatial skills before the experimental procedure. Due to the similarity of the groups, the Mann-Whitney U test was also used to compare the post-test data.

1.2. Post-test: Table 4 shows the Mann-Whitney U test results for the SOT post-test scores of the experimental and control groups.

Table 4. *Mann-Whitney U test results for SOT post-test scores*

Groups	N	Mean Rank	Sum of Ranks	U	Z	p
Experimental	10	9.90	99.00	44.00	-0.789	0.430
Control	11	12.00	132.00			

Table 4 shows that the U-value was 44.00 and the p-value was 0.430. The p-value greater than 0.05 indicates that there is no significant difference between the experimental and control groups in their SOT post-test scores. It can thus be said that playing the ETS 2 videogame had no effect on the spatial skills of gifted students in the experimental groups. In other words, the levels of spatial skills of the experimental group playing the game were similar to those of the control group receiving no intervention.

1.3. Pre-test and post-test findings for the experimental group: Table 5 shows the Wilcoxon signed-rank test results for the SOT pre-test and post-test scores of the experimental group.

Table 5. *Wilcoxon Signed-Rank Test results for experimental group's spatial orientation*

Score	Ranks	N	Mean Rank	Sum of Ranks	Z	p
SOT Post-test – SOT Pre-test	Negative	4	3.38	13.50	-0.639	0.523
	Positive	4	5.63	22.50		
	Ties	2				
	Total	10				

When the Wilcoxon signed-rank test was used to assess the significance of the difference between the SOT pre-test and post-test scores of the experimental group, the Z-value was -0.639 and the p-value was 0.523. These results show that there is no significant difference between the SOT pre-test and post-test scores of the experimental group ($p > .05$). In other words, the experimental procedure did not have a significant effect on the levels of spatial skills of the experimental group.

2. *Quantitative Findings on Entrepreneurship*

2.1. Pre-test: Table 6 shows the Mann-Whitney U test results for the ESSSS pre-test scores of the experimental and control groups.

Table 6. *Mann-Whitney U Test results for ESSSS pre-test scores*

Groups	N	Mean Rank	Sum of Ranks	U	Z	p
Experimental	10	9.55	95.50	40.50	-1.022	0.307
Control	11	12.32	135.50			

No significant difference was found between the experimental and control groups in their ESSSS pre-test scores (Table 6). It can thus be said that the experimental and control groups had similar levels of entrepreneurial skills before the experimental procedure was conducted. Due to the similarity of the groups, the Mann-Whitney U test was also used to compare the post-test data.

2.2. Post-test: Table 7 shows the Mann-Whitney U test results for the ESSSS post-test scores of the experimental and control groups.

Table 7. *Mann-Whitney U Test results for ESSSS post-test scores*

Groups	N	Mean Rank	Sum of Ranks	U	Z	p
Experimental	10	9.15	91.50	36.50	-1.304	0.192
Control	11	12.68	139.50			

According to the results of the Mann-Whitney U test used to assess the significance of the difference between the experimental and control groups in their ESSSS post-test scores, the U-value was

36.50 and the p-value was 0.192. The p-value greater than 0.05 indicates that there is no significant difference between the experimental and control groups in their ESSSS post-test scores (Table 7). In other words, playing ETS 2 video game had no effect on the entrepreneurial skills of gifted students or the levels of entrepreneurial skills of the experimental group playing the game were similar to those of the control group receiving no intervention.

2.3. Pre-test and post-test findings for the experimental group: Table 8 shows the Wilcoxon signed-rank test results for the ESSSS pre-test and post-test scores of the experimental group.

As seen in Table 8, according to the results of the Wilcoxon signed-rank test used to assess the significance of the difference between the ESSSS pre-test and post-test scores of the experimental group, the Z-value was -0.051 and the p-value was 0.959. It can thus be said that there is no significant difference between the ESSSS pre-test and post-test scores of the experimental group ($p > .05$). In other words, the experimental procedure did not have a significant effect on the levels of entrepreneurial skills of the experimental group.

Table 8. Wilcoxon Signed-Rank Test results for experimental group's entrepreneurship

Score		Ranks	N	Mean Rank	Sum of Ranks	Z	p
Entrepreneurship Post-test – Entrepreneurship Pre-test		Negative	5	5.00	28.00	-0.051	0.959
		Positive	5	5.40	27.00		
		Ties	0				
		Total	10				

3. Qualitative Findings

The qualitative data obtained from each student in the experimental group were examined in terms of income, percentage of roads discovered, number of completed and cancelled deliveries, number of workers (employed drivers), trailers, and garages. Income status of students throughout the process is shown in Figure 1, percentages of roads discovered is shown in Figure 2 while the completed and cancelled deliveries are shown in Figure 3. Furthermore, data addressing the number of employed drivers, trailers and garages were mentioned.

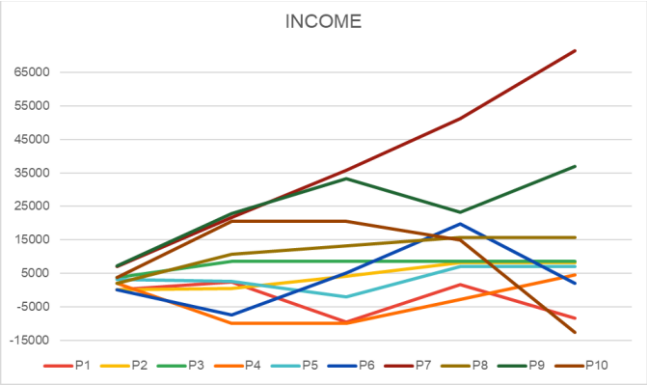

Figure 1. *Weekly balance status of students*

Figure 1 shows that the weekly balances of the students in the experimental group do not show great changes in general. The fact that the balances of students coded as P1, P4, P5, and P6 are considerably negative in the graph draws attention to the debt status of these students. It is seen that only two students (P7, P9) had important accelerations in their balances and that there are no serious changes in the balances of the remaining students. The balance of P7 has exceeded $ 70.000, while the balance of P9 is close to $ 40.000. Except for these two students, it is seen that there are no major changes in the balances of the other students. This can be considered as evidence that the entrepreneurship levels of the students, especially in the context of evaluation opportunities and taking risks, did not improve throughout the videogame play.

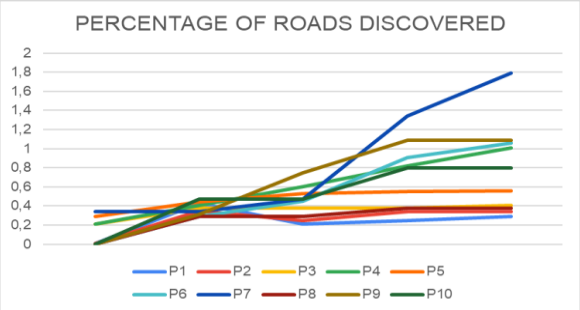

Figure 2. *Percentage of roads students explore*

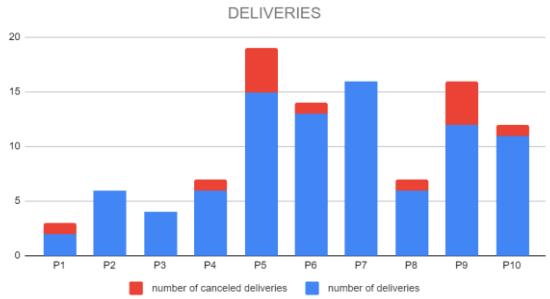

Figure 3. *Number of completed and cancelled deliveries*

After six weeks of video game playing, the road discovery rates of the students in the experimental group ranged 0.3% to1.8% which is quite limited (Figure 2). Researchers believe that the more roads discovered the more contribute to the spatial orientation skills of gifted children and the obtained rates explain why the simulation game process does not improve the spatial skills of them. Also, this data coincides with the finding that the video game was not effective in developing students' spatial orientation and entrepreneurship skills. When it was considered especially in the context of entrepreneurship, there may be situations where students did not need to use their usual ways frequently and make an effort to discover new ways. Another reason for the low road discovery rates may be that the implementation takes 6 weeks. In addition, Figure 3 shows that the most deliveries were made by P7 (n=16), p5 (n=15) and P9 (N=12), and the most delivery cancellations were made by P5 (n=4) and P9 (n=4). These results generally overlap with other graphic findings. P7 and P9 are also the two students who had the highest income and percentage of roads discovered. However, students' average of completed deliveries throughout six weeks (8.7 jobs) and weekly (1.45 jobs) are quite low. Furthermore, only three gifted students out of ten (P6, P9, P10) prefer to buy semi-truck. Considering these three gifted students had completed deliveries above average, it is an expected finding. Although the number of completed deliveries of P5 and P7 was higher than the others, it was determined that they did not buy the semi-truck. The reason for this may be that the balance of P5 does not show large changes despite the deliveries and P7 chooses to accumulate its balance. It was also determined that none of the gifted students employed workers, did not buy trailers or garages during the six-week implementation process. These results prove that such a simulation game does not improve the entrepreneurship of gifted students.

Students also reported that they paid attention to making more money in short delivery time (the time-money relationship) when choosing a task in the weekly progress form. They also reported that they prefer products with low risk of transportation (such as milk, onion, cake, flower, water etc.). Another situation that students took into consideration while choosing a task was the distance-money relationship. In the context of distance, it has been determined that they preferred the roads with less distance and therefore the shipments with less time. Choosing the roads with less distance has also caused the percentage of the roads they discovered to be low. For this reason, it was expected that there is no significant difference in spatial skills. In the weekly form collected from students, it was questioned that what did students do with the money they earned and it was determined that gifted students often prefer to save their money. This finding coincides with the finding that the entrepreneurship levels of the students did not change significantly.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Spatial and entrepreneurial skills play a key role in identifying gifted students; however, existing curricula usually neglect these skills while focusing on the development of verbal or numerical skills (Andersen, 2014; Ertekin 2017). Furthermore, teachers' lack of information or misconceptions about the characteristics of gifted children and the misbelief that gifted students can learn on their own without assistance cause gifted children to be neglected, get bored with education, and fail to fulfill their true potential (Akar & Akar, 2012; Altıntaş & İlgün, 2016; Kroesbergen et al., 2016; Yoleri et al., 2018). However, some alternative ways can be used to ensure the development of spatial and entrepreneurial skills of gifted students (Coxon, 2012). Simulation video games can be considered as one of these

alternatives. Because video games have become one of the most important entertainment activities for children and adolescents in today's digital age (Kuss & Griffiths, 2012). Given that simulation video games simulate real-world activities and support new learning and skills development (Adeyemi & Ajibade, 2011; Bilesanmi Awoderu, 2006; Liu et al., 2011; Yılmaz et al., 2022b), they can contribute to the development of different skills in players. Moreover, skills such as problem solving (Tassell et al., 2018), creativity (Sazalli et al., 2021), which are thought to be necessary for entrepreneurship, can be developed with video games.

After the six-week experimental procedure in the present research, the analysis results showed no statistically significant difference between the pre-test and post-test scores of the gifted children in the experimental and control groups. This result indicates that the video game intervention in the experimental group and the regular teaching approach in the control group did not lead to a significant difference in gifted students' spatial orientation and entrepreneurial skills. This result can be interpreted in several ways. First, gifted students are impatient and not willing to do repetitive tasks (Markusic, 2012; Özbay & Palancı, 2011; Ulus et al., 2019). They are most likely to get bored of prolonged or monotonous activities and become interested in other things (Sezer, 2015). Gifted children's skills may even deteriorate in settings that fail to address their needs (Walters & Frei, 2007). Gifted children are more willing to take on increasingly diverse and complex tasks than their peers (Tannenbaum, 2003). Although video games are among the most preferred leisure activities for children, research has shown that children mostly prefer video games primarily designed for entertainment (e.g., action, adventure, role-playing, etc.) and they less frequently prefer educational and serious (e.g., simulation games) (Mazurek & Engelhardt, 2013; Yılmaz et. al., 2022a). Therefore, doing similar activities in the game for weeks (i.e. driving a truck, delivering product) might have been perceived as a boring activity for gifted children, and this might have led to a loss of motivation. In addition, Sevgili Koçak, (2019) reported that gifted students have negative thoughts towards video games. Therefore, it would be insightful to examine the effect on spatial skills of increasingly challenging non-routine tasks or activities (e.g., video game design) that enable gifted children to fulfill their true potentialities in line with their individual needs.

Second, gifted students are more successful in spatial visualization, spatial relations, and spatial orientation questions than their peers (Bayazıt & Harput, 2019; Çetin et al., 2017; Kurnaz, 2018). This might be due to the quality of gifted children's thinking processes. Gifted children can engage in strategic and flexible thinking to approach problems that they encounter (Andersen, 2014; Keleş & Yazgan, 2022). Therefore, the video simulation game used in this research may have been insufficient to further increase the spatial skills of gifted children who already have these skills.

Another finding of the present research is that there was no statistically significant difference between the experimental and control groups in their post-test entrepreneurship scores. This finding indicates that the activities conducted in the experimental and control groups did not lead to a significant difference in their entrepreneurial skills. This finding is also consistent with the qualitative findings of the research. Looking at the weekly progress reports of the experimental group, it is seen that only a few students (n = 3) purchased a truck, and no students undertook a different venture (e.g., purchasing trailers or garages or starting a business). The reports also showed that the gifted students saved the money that they earned from deliveries and rarely preferred to make investments. In addition, it was observed that students in the experimental group frequently used the roads that they were accustomed to and they did not try to discover new roads. It can be considered as another reason why gifted children's entrepreneurial skills did not develop. Also, this may be because the intervention time was limited to 12 hours.

Earlier studies have reported similar findings. Şahin et al. (2014) found no significant difference between gifted students and non-gifted students in their entrepreneurial skills. Likewise, Akbayrak and Oğuz Namdar (2020) concluded that drama-based activities did not create a significant change in the entrepreneurial knowledge and intentions of gifted elementary school students. However, it has also been found that gifted students have a high level of science-based entrepreneurial skills (Akdağ et al., 2017; Kızkapan & Nacaroğlu, 2021; Özçelik & Akgündüz, 2018; Yangın et al., 2022). Given that gifted students have certain IQ scores, this result comes as no surprise. However, entrepreneurial skills related to daily life discussed in the present research are different from science-based entrepreneurial skills and may be inversely proportional. Akdağ et al. (2017) reported a significant negative correlation between

gifted secondary school students' risk-taking and science achievement. Taken together, these results show that entrepreneurial skills related to daily life are not among the basic skills possessed by gifted children and thus, they need to be improved. However, as discussed in the literature, some educational techniques and methods alone may not be sufficient to develop gifted students' entrepreneurial skills. Thus, it would be helpful to investigate the effectiveness of activities based on the blend of multiple methods. On the other hand, the fact that the students played the simulation game for a limited time (12 hours) in total and that it might be insufficient for them to explore the roads or earn enough money could be other possible reasons why both the spatial skills and entrepreneurship skills of the gifted students did not differ significantly from the control group.

Limitations and Future Research

The present study has its own limitations that should be mentioned. Since the parents have prejudices towards videogames and busy schedules of both gifted children and science and art center, the experimental process had to be limited to two hours per week and six weeks in total. The future research carried out with non-gifted (normal) students whose parents have not prejudices toward video games will allow researchers to make longer-term implementations. Due to their personal characteristics, gifted children can get bored with routine tasks (i.e. continuously doing the same things in a video game) more quickly compared to the normal students. Further research might also examine the effect of increasingly challenging non-routine tasks that enable gifted children to fulfill their true potential on their entrepreneurial and spatial skills (*e.g. video game design task*) and the results can be compared. The need for school computers to carry out the study and the desire for active use of these computers by the school teachers was another important factor that limited the implementation hours. In the further studies, in order to avoid such a limitation and to integrate the developing technologies into the education, longer-term implementations can be utilized by using alternative technological devices such as mobile phones, virtual reality, augmented reality, etc. and the results can be compared.

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Video Oyunlarının Üstün Yetenekli Çocukların Mekânsal Yönelim ve Girişimcilik Becerileri Üzerindeki Etkisinin Belirlenmesi

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Özet:

Bu çalışmada video oyunlarının üstün yetenekli çocukların mekânsal yönelim ve girişimcilik becerileri üzerindeki etkisinin incelenmesi amaçlanmıştır. Araştırmada eşzamanlı iç içe desene dayalı karma yöntem kullanılmıştır. Çalışmanın nicel kısmında seçkisiz ön test son test kontrol gruplu desen, nitel kısmında ise durum çalışmasından yararlanılmıştır. Araştırma Bilim ve Sanat Merkezi'nde destek eğitimine gelen 21 gönüllü ortaokul öğrencisi ile yürütülmüştür. Çalışmanın deney grubunda 10, kontrol grubunda 11 öğrenci yer almıştır. Araştırmada veri toplama aracı olarak Uzamsal Yönelim Testi, Ortaokul Öğrencilerine Yönelik Girişimcilik Ölçeği ve Haftalık İlerleme Formu kullanılmıştır. Ek olarak her bir öğrencinin oyundaki kariyer ilerlemeleri ve profilleri her hafta uygulama sonunda fotoğraflanmıştır. Deney grubundaki öğrenciler Euro Truck Simulator 2 video oyununun 6 hafta boyunca oynamışlardır. Deneysel uygulama sonrasında deney ve kontrol grubunda yer alan üstün yetenekli öğrencilerin ön-test puanlarına göre son-test puanlarında istatiksel olarak anlamlı bir şekilde farklılaşma olmadığı belirlenmiştir. Ayrıca deney grubunun ön test ve son test puanları arasında da manidar bir farklılık olmadığı görülmüştür. Bu sonuç deney ve kontrol gruplarında gerçekleştirilen uygulamaların üstün yetenekli öğrencilerin mekânsal yönelim ve girişimcilik becerilerini manidar olarak farklılaştırmadığını göstermektedir. Nitel bulgular, üstün yetenekli çocukların daha çok kazandıkları parayı biriktirmeyi tercih ettiklerini, risk almadıklarını ve düşük riskli taşımalı ürünleri taşımayı tercih ettiklerini ortaya koymuştur. Bu sonuçlar girişimcilik becerisinin en önemli göstergelerinden biri olan risk alma alt davranışının gösterilmediğini göstermektedir. Nicel bulguların nitel bulgularla desteklendiği görülmektedir. Üstün yetenekli öğrencilerin potansiyellerini daha iyi ortaya koyabilecekleri ve tekdüzelikten uzak gittikçe zorlaşan/karmaşıklaşan görevler içeren uygulamaların onların girişimcilik ve mekânsal becerileri üzerindeki etkisi incelenerek elde edilen sonuçlar karşılaştırılabilir.

Anahtar kelimeler: *Üstün yetenekli çocuklar, Mekânsal yönelim, Girişimcilik, Video oyunları, Beceri eğitimi*

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Genişletilmiş Özet

Problem: Genel itibariyle mekânı anlamaya, yorumlamaya ve ona göre hareket etmeye yönelik becerilere ise mekânsal beceriler denilmektedir. Mekânsal becerilere sahip olmak öğrenciler açısından öğrenme sürecinin ayrılmaz bir parçası olarak kabul edilmektedir (Kell vd., 2013). Yapılan çalışmalar mekânsal beceriler ile bilim, teknoloji, mühendislik ve matematik (STEM) alanlarındaki başarı arasında güçlü bir ilişki olduğu göstermektedir (Buckley vd., 2018; Wai vd., 2009). Bu güçlü ilişki sadece STEM'i değil, sosyal bilgiler gibi farklı disiplinlerdeki başarıyı da kapsamaktadır. (Newcombe, 2013).

Literatür incelendiğinde çok farklı yaklaşımlar olsa da (Carroll, 1993; Hegarty vd., 2006; McGee, 1979; Linn & Petersen, 1985; Lohman, 1979; Lohman, 1988; Uttal vd., 2013) genel anlamda mekânsal beceriler; mekânsal yönelim, mekânsal görselleştirme ve zihinsel döndürme alt faktörlerine ayrıldığı ifade edilebilir (Ramful vd., 2017). Mekânsal yönelim; mekânda konumumuzu bilmemize, mekânsal öğelere göre konumumuzu ayarlamamıza, kendi kendimize ya da harita veya navigasyon uygulamaları gibi çeşitli araçlarla gezinmemize olanak tanıyan becerilerimizdir. Mekânsal yönelim eğitim ortamında uygulamaya dönük olarak en fazla geliştirebileceğimiz becerilerden birisidir. Mekânsal yönelim ya da genel olarak mekânsal beceriler çok önemli olmasına rağmen eğitimciler tarafından ihmal edilmektedir (Mathewson, 1999). Potansiyel faydalar göz önüne alındığında, çocukların mekânsal yönelim becerilerinin geliştirilmesinin oldukça önemli olduğu söylenebilir. Özellikle düşük ve orta gelirli ülkelerde mekânsal beceri eğitimi çocukların yaratıcılığını ve potansiyelini geliştirmeye ve ortaya koymaya imkân tanıyabilir (Borzekowski vd., 2022).

Diğer taraftan ülkelerin ekonomik gelişimlerini sürdürebilmeleri ve rekabetçi bir yapıya sahip olmaları hızla değişen ve gelişen dünya ekonomisine ayak uydurabilmeleri açısından kaçınılmazdır. Bu rekabet gücünün özünde girişimci yani yenilik yapma cesareti olan, risk alan, özgüveni yüksek, inisiyatif alabilen ve yaratıcı bireyler bulunmaktadır (Aladağ, 2017). Iredale (1993) yüksek motivasyon ve özgüvene sahip olma, daha bağımsız ve sorumluluk sahibi olma, düşüncelerinde ve eylemlerinde daha yaratıcı olma, daha fazla inisiyatif alabilme, fırsatları daha iyi değerlendirebilme, başarısızlıklarla daha iyi başa çıkabilme, kaynakları daha iyi yönetebilme, grup içi çalışmaya daha yatkın olma, riskleri daha iyi hesaplayabilme ve karşılaştığı problemleri daha iyi çözümleyerek karar verebilme becerilerinin girişimci bireylerin sahip olduğu temel beceriler olduğunu vurgulamaktadır. Girişimcilik ve mekânsal yönelim becerisi diğer pek çok beceride olduğu gibi erken yaşlarda kazandırılması ve geliştirilmesi gereken bir becerilerdir. Nitekim Heinz (2002), bireylerin gelecek yaşamlarında elde edebileceği başarıların ya da başarısızlıkların temelinde kişisel, ailevi ve edinilen deneyimlerin önemli bir rol oynadığını belirtmektedir. Dolayısıyla Milli Eğitim Bakanlığı (MEB) tarafından hazırlanan ve 2005 yılı itibariyle kullanıma sunulan "Sosyal Bilgiler Dersi Öğretim Programında" mekânı algılama, harita okuryazarlığı, konum analizi ve girişimcilik becerilerine yer verilerek bu becerilerin erken yaşlardan itibaren çocuklara kazandırılması hedeflenmiştir (MEB, 2005).

Üstün yetenekli çocuklar tipik olarak yüksek bilişsel yeteneğe sahiptirler yani ortalamanın üzerinde zekâ düzeyine (IQ) sahip olmak üstün yeteneğin klasik bir özelliği olarak kabul edilir (Marland, 1972). Çünkü her ne kadar üstün yetenekliliğin göstergelerini tespit etmek için çeşitli göstergeler (çocukların davranışlarına ve gelişimlerine yönelik öğretmen ve ebeveyn gözlemi, okul başarısı vb.), bu öğrencileri belirlemek adına üzerinde geniş bir fikir birliğine varılmış tek yöntem çocukların IQ değerlerinin saptanmasıdır (Vaivre-Douret, 2011). Üstün yeteneklilerin eğitiminde görsel-mekânsal yetenek nadiren ölçülür ve nispeten ihmal edilir (Andersen, 2014). Üstün yetenekli çocukların özelliklerinin keşfedilememesi ve doğru zamanda doğru eğitimin verilememesi toplum açısından telafisi mümkün olmayan kayıplara yol açabilir. Eğitim politikalarının çoğunluğun ortak yeteneklerini keşfetmeye odaklanması, bu öğrencilere yeterli desteğin sağlanamaması gibi nedenler üstün yetenekli çocukların göz ardı edilmesine, başarısız olmalarına veya eğitim sürecinden sıkılmalarına yol açmaktadır (Altıntaş & İlgün, 2016; Kroesbergen vd., 2016). Diğer yandan, "üstün yetenekli çocuklar yardım almadan kendi kendilerine öğrenebilir" algısı onların ihtiyaç duyduğu eğitim hizmetlerinin ihmal edilmesine ve dolayısıyla da sahip oldukları potansiyellerini tam olarak yansıtamamalarına neden olabilir. Dolayısıyla üstün yetenekli çocukların sahip oldukları potansiyellerinin tamamını ortaya çıkarabilmelerini sağlamalarına yardımcı olacak ve onların ilgi, istek ve yeteneklerini dikkate alan alternatif yollardan yararlanılması ihtiyacını ortaya koymaktadır.

Oyun, hoş vakit geçirmek üzere bireysel veya birlikte gerçekleştirilen bedensel, zihinsel ve duyuşsal faaliyetler olarak tanımlanabilir (Toprakçı, 2017). Gerçek yaşamda oyunların eğitimde kullanıldığı gibi, araştırmacıların da belirttiği üzere iki durumdan ötürü simülasyon türündeki video oyunlardan çocukların beceri gelişimleri açısından yararlanılabilir. Birincisi araştırmalar (Granic, vd., 2014; Kuss & Griffiths, 2012; Yılmaz vd., 2022a) göstermektedir ki günümüz teknoloji çağında video oyunları neredeyse tüm çocukların ve ergenlerin hayatlarının önemli eğlence ve boş zaman aktivitesi haline gelmiştir. Bunun yanında yeni nesil video oyunlarının kullanıcılara daha gerçekçi içerikler sunması, oyuncuları eğlendirirken aynı zamanda da bilgi ve beceriler kazandırabilmesi bu oyunları diğer pek çok yönteme göre daha avantajlı bir konuma sokmaktadır (Di & Zheng, 2022; Wauck, 2020). Her ne kadar simülasyon oyunlarının çocukların farklı bilişsel, duyuşsal ve psikomotor becerileri üzerindeki etkisini araştıran farklı çalışmalar gerçekleştirilmiş olsa da araştırmacıların bilgisi dahilinde üstün yetenekli öğrencilerin mekânsal yönelim ve girişimcilik becerilerini inceleyen çalışma bulunmamaktadır. Bunun yanında üstün yetenekli öğrencilerin mekânsal becerileri incelenirken genelde mekânsal görselleştirme ve zihinsel döndürme alt faktörlerinin kullanıldığı belirlenmiştir. Üstün zekâlı öğrencilerin mekânsal yönelim becerilerinin inceleyen çok az çalışmaya rastlanmıştır (Chan, 2007). Üstelik sayısal, sözel ve uzamsal sembol sistemleri göz önüne alındığında mekânsal beceriler üstün yetenekli eğitimde hesaba katılması gerekir (Wai & Worrell, 2015). Dolayısıyla bu çalışmanın amacı simülasyon türündeki bir video oyun olan "Euro Truck 2 (ETS2)" video oyununun üstün yetenekli öğrencilerin mekânsal yönelim ve girişimcilik becerileri üzerindeki etkisinin belirlenmesidir.

Yöntem: Dolayısıyla bu araştırma eşzamanlı iç içe desene dayalı olarak yürütülmüş bir karma yöntem araştırmasıdır. İç içe desende, araştırmadaki nicel veriler ile ilişkili olarak nitel verileri de ikinci bir veri olarak toplamak ve analiz etmek söz konusudur (Cresswell & Plano Clark, 2011). Araştırmanın deney grubu 10 (4 kız, 6 erkek), kontrol grubunda ise 11 (4 kız, 7 erkek) öğrenciden oluşmaktadır. Tüm öğrencilerin yaşları 10 ile 13 arasında değişmektedir. Araştırmada veri toplama aracı olarak "Uzamsal Yönelim Testi (UYT)", "Ortaokul Öğrencilerine Yönelik Girişimcilik Ölçeği (OÖGYÖ)" ve "Haftalık İlerleme Formu" kullanılmıştır. Ek olarak her bir öğrencinin oyundaki kariyer ilerlemeleri ve profilleri her hafta uygulama sonunda fotoğraflanmıştır. Bu fotoğraflardan bakiye, tamamlanan teslimat sayısı, iptal edilen teslimat sayısı, çekici adedi, keşfedilen yollar yüzdesi, dorse adedi ve garaj adedi gibi değişkenlerin incelenmesi amaçlanmıştır. Ön test uygulamasından sonra öğrencilere bir haftalık uyum çalışması yapılmıştır. Oryantasyon çalışması kapsamında oyunda nasıl hesap açılacağı öğretilerek oyunda gerçekleştirebilecekleri uygulamalardan ve oyunda klavye (tuş takımı) ve mouse kullanımından söz edilmiştir. Ayrıca tuş takımında hangi tuşla ne işlem yapıldığına dair bir form öğrencilere her uygulama haftasında tekrar dağıtılmıştır. Deneysel uygulama ise altı hafta boyunca ve haftada 2 saat olacak şekilde gerçekleştirilmiş ve ardından son testler uygulanmıştır. Nitel veriler kapsamında öğrenciler her hafta "haftalık ilerleme formunu" doldurmuş ve ayrıca öğrencilerin uygulamanın sonunda oyun kariyer/profil ekranı araştırmacılar tarafından fotoğraflanarak kaydedilmiştir.

Sonuçlar: Altı hafta boyunca devam eden deneysel uygulama sonrasında yapılan sontest sonuçları incelendiğinde; deney ve kontrol grubunda yer alan üstün yetenekli öğrencilerin öntest puanlarına göre sontest puanlarında istatiksel olarak manidar bir şekilde farklılaşma olmadığı belirlenmiştir. Elde edilen bu sonuç birkaç şekilde yorumlanabilir. Öncelikle alanyazın göstermektedir ki üstün yetenekli öğrenciler tekrarlayan görevleri yapma konusunda istekli olmamakla birlikte sabırsızlardır (Markusic, 2012; Özbay ve Palancı, 2011). Her ne kadar video oyunları çocuklar tarafından en fazla tercih edilen boş zaman etkinliklerinden birisi olsa da araştırmalar çocukların ağırlıklı olarak birincil üretim amacı eğlence olan (örn. aksiyon, macera, rol yapma vb.) video oyunları tercih ettiğini, eğitsel ve ciddi (serious) oyunları (örn. simülasyon türü oyunlar) ise daha en az tercih ettiklerini göstermektedir (Mazurek & Engelhardth, 2013; Yılmaz vd., 2022a). Dolayısıyla haftalar boyunca oyun içerisinde benzer şeyleri yapmak (örn. tır sürmek) üstün yetenekli çocuklar için bir süre sonra sıkıcı bir faaliyet olarak algılanmış ve bu durum onlarda sürece ilişkin motivasyon kaybına neden olmuş olabilir.

Çalışmada elde edilen bir diğer sonuç ise deney ve kontrol gruplarının sontest girişimcilik puanları arasında istatiksel olarak manidar bir farklılığın olmadığıdır. Bu bulgu elde edilen nitel bulgular ile de örtüşmektedir. Öğrencilerin "haftalık ilerleme raporları" ile fotoğraflanan kariyer gelişimleri incelendiğinde öğrencilerin altı hafta sonunda sadece çok az bir bölümünün (n=3) çekici aldığı, bununla beraber hiçbir öğrencinin farklı bir girişimde (dorse, garaj satın alma, şoför çalıştırma veya şirket kurma

vb.) bulunmadığı görülmüştür. Öğrencilerin teslimatlardan kazandıkları paraları ise genellikle biriktirme yoluna gittikleri nadiren yatırım yapmayı tercih ettikleri belirlenmiştir. Yapılan çalışmalar incelendiğinde benzer sonuçlara ulaşıldığı görülmektedir. Şahin vd. (2014) üstün yetenekli öğrenciler ile normal eğitime devam eden öğrencilerin girişimcilik becerileri arasında manidar farklılık olmadığını tespit etmiştir. Bununla beraber yapılan bazı araştırmalarda üstün yetenekli öğrencilerin bilime dayalı girişimcilik becerilerinin yüksek olduğu bulunmuştur (Akdağ vd., 2017; Kızkapan & Nacaroğlu, 2021; Özçelik & Akgündüz; 2018). Ancak mevcut çalışmada ele alınan günlük yaşama dair girişimcilik becerisi bilime dayalı girişimcilik becerisinden farklıdır ve ters orantılı olabilir

Sınırlılıklar ve Gelecek Çalışmalar: Bu çalışmanın bahsedilmesi gereken bazı sınırlılıkları mevcuttur. Araştırmaya katılan bazı öğrenci ailelerinin dijital oyunlara karşı önyargılara sahip olması ve öğrenciler ile uygulama yapılan okulun yoğun programlarının olması nedeniyle çalışma haftada iki saat ve toplam 12 saat ile sınırlandırılmıştır. Gelecekte dijital oyunlara karşı önyargısı problemi olmayan ailelerin çocukları ile daha uzun süreli çalışmalar yapılabilir. Bir diğer sınırlılık ise üstün yetenekli çocuklar, karakteristik özelliklerinden dolayı onlar için rutin sayılabilecek uygulamalardan (oyun içerisinde sürekli olarak benzer eylemleri gerçekleştirmek) normal öğrencilere nazaran daha çabuk sıkılabilmektedir. İleriki çalışmalarda üstün yetenekli öğrencilerin potansiyellerini daha iyi ortaya koyabilecekleri ve tekdüzelikten uzak gittikçe zorlaşan/karmaşıklaşan görevler içeren uygulamalar (örneğin dijital oyun tasarlamak) kullanılarak onların girişimcilik ve mekânsal becerileri üzerindeki etkisi incelenebilir ve elde edilen sonuçlar karşılaştırılabilir. Uygulamaların gerçekleştirilebilmesi için okul bilgisayarlarına ihtiyaç duyulması ve bu bilgisayarların aynı zamanda okuldaki öğretmenler tarafından aktif olarak kullanılması uygulama saatlerinin sınırlandırılmasına neden olan bir diğer önemli etmendir. Bu tür bir sınırlılık yaşanmaması ve gelişen teknolojinin eğitime bütünleştirilmesi adına ilerideki çalışmalarda imkânlar dâhilinde cep telefonu, sanal gerçeklik, artırılmış gerçeklik vb. cihaz aracılığıyla daha uzun soluklu uygulamalar yapılarak elde edilen sonuçlar karşılaştırılabilir.