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Examination of the effect of educational game activities on the levels of creativity of the students attending to elementary schools in Turkey

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Abstract

The purpose of this study is to examine the effect of educational game activities on the levels of creativity of the students attending to elementary schools in Turkey. The research group consists of a total of 251 students, among which 132 are males and 119 are females, attending to 6th, 7th and 8th grades in Tatarli Cumhuriyet Elementary School and in Tatarli Elementary school, both located in Tatarli county of the city of Afyon ($\bar{x}$ age=13.0319 $\pm$ 1.17). To begin with, the available information pertaining to the purpose of the study has been systematically provided through literature review. By this way a theoretical frame on the subject has been established. Secondly, students were asked to play 2 educational games at the beginning and end of their gym classes for a period of 8 weeks. The games were selected by taking their attention, skill, reaction and agility developing features as basis. A creativity scale was applied both at the beginning and the end of the period of 8 weeks. For data analysis and interpretation, pre-test and final test results have been evaluated by utilizing Kolmogorov-Smirnov and Paired Sample t test, and significance has been taken as $p < 0.05$. In order to evaluate the data and obtain the calculated values, SPSS packet program has been utilized and (Cronbach Alpha) has been found out to be 0.72. In conclusion, it has been determined that educational games influence the creativity levels of the students attending to elementary schools.

Keywords: Educational game; Creativity; Elementary education; Student

1. Introduction

Regardless of how simple they are, games always have some effects on players. Children learn to develop self-respect, as well as showing respect to others. While treating others' rights

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with respect, they also put up a struggle for protecting their own rights and by this way they learn to fight for their rights while showing others' respect. This aspect of educational games develops children's determination. In group games, children find themselves in situations where both directing other children and being directed is required. In such situations some children want to have themselves and their opinions accepted by others and to direct others. This leads to a struggle for influence and develops children's leadership characteristics. Because honesty is promoted while playing the games, children understand that being honest earns esteem for the individual and they adopt honesty. In order to win the game players have to try different options and make different attempts. With such a requirement, games makes passive children act more actively and encourages shy children.

Personal characteristics such as self-confidence, self-assessment, quick decision making, cooperating with others, honesty, protecting own rights and discipline are developed while playing the game. Also traits such as working as a team, getting along with others and sharing feelings and thoughts, as well as sharing the playground and gaming tools, are all learned while playing the games. The games teach children manners [1].

A child playing a game is within its own imaginary world. However, the matters the games focus on are real. While playing the games children mix their own imagination with the reality and this develops their creativity. In fact, creativity is always based on games. Is it not true that drawing is a game played with lines while so are music with notes, poem with words and dancing with movements?

According to Schafer, the differences among secondary school students manifest themselves mostly on their creativity skills, rather than mental skills. These traits depend on the early childhood play making and imagining play mates capacity of children [2-3].

Creativity surfaces as a result of the impulses received by human brain and the stimulants generating these impulses vary from people to people [4-5]. Easier perception of these impulses depends on the strength and level of the impulse. An impulse addressing more than one sense will naturally be perceived faster. Also within the scope of education system, conveying knowledge to the recipient easier and transforming this new knowledge into other new knowledge will promote creativity. At this point, teaching methods and techniques that will ensure individuals' motivation and keep their interest to the lecture alive are needed. Several methods can be implemented in order to ensure that creative individuals, as the deriving force in the development of the society they are in, will not loose their creativity.

Games that play an important role in developing children's imagination and creativity, besides their physical, mental, social and linguistic development, take the first place among these methods. While a number of games, intended to develop creativity, can be implemented before formal education with this purpose, creativity developing educational games can be applied within the process of education. Educational game is a multi-dimensionally creative learning process that enables a child to learn from other children, from its own experience and from its interaction with its environment and with objects [6]. According to Mechling, tending towards intriguing and creative games, in a conscious way as per the personal traits of children, especially in their school age constitutes the basis of being scientific. In the following part, while creativity and the importance of creativity are emphasized, game and the importance of game in education process have tried to be explained and the importance of games in developing creativity has been referred [7].

For developing creativity games, as the indispensable parts of children's world, can be utilized along with establishing the proper class mood and feedback. It is a well known fact that creativity starts with the birth of an individual and can be manifested more intensely during young ages. Especially for children in playing ages and in concrete operational periods, developing creativity can be enhanced through games. In order to develop creativity,

educational games can be utilized in classrooms according to the aimed gains and the readiness of the children. For this, school yards, classrooms, parks and other convenient areas should be rearranged and opened for such activities. Also techniques as brainstorming, attribute listing, using metaphors, creative drama and improve creativity. Further, pre-school and elementary school children can be asked to play games focused on perceiving social facts, imitating feelings, struggling against difficulties, solving problems, setting forth different opinions, discussing, role-playing, imitating, cooperating, appreciating and trust developing, in order to improve creativity [8-9].

Creation of imaginary play scenes, or play scenes similar to reality, during the game, enables children to make decisions and manifest various facts and problems. This enables the children to utilize their cognitive skills for answering questions and ensures their cognitive development level is improved against new situations and questions. Also, since most of the games are imaginative and therefore urge creative force, they will provide positive contribution to the creativity skill in children. Even if it may not be in a planned way, at this point creativity skills of the individuals will also develop. This is because of the fact that creativity is to reach something new from something old; it is to find new paths to solution and to regard things with a new and original viewpoint. Also, it is clear that the individuals' creativity skills can be manifested easier and more systematically, if games are designed in a planned and purposeful way [10].

It is possible to assert that creativity is essential and important in all aspects of life. For this reason creativity potential available to all individuals should be brought into light and the skill of creative thinking should be brought to individuals.

The purpose of this study is to examine the effect of educational game activities on the levels of creativity of the students attending to elementary schools in Turkey. At this point, the study will seek the answers to the following main questions:

- Examination of the effects of educational game activities on the creativity levels of the students attending to 6^{th} grade,
- Examination of the effects of educational game activities on the creativity levels of the students attending to 7^{th} grade,
- Examination of the effects of educational game activities on the creativity levels of the students attending to 8^{th} grade.

2. Method

The research group consists of a total of 251 students, among which 132 are males and 119 are females, attending to 6^{th}, 7^{th} and 8^{th} grades in Tatarli Cumhuriyet Elementary School and in Tatarli Elementary school, both located in Tatarli county of the city of Afyon ($\bar{x}$ age = 13.0319$\pm$1.17).

To begin with, the available information pertaining to the purpose of the study have been systematically provided through literature review. By this way a theoretical frame on the subject has been established. Secondly, students were asked to play 2 educational games at the beginning and end of their gym classes for a period of 8 weeks. The games were selected by taking their attention, skill, reaction and agility developing features as basis. At the beginning and end of the period of 8 weeks, the creativity scale developed by Whetton and Cameron [11] and adapted into Turkish by Aksoy [12] has been applied.

With the purpose of determining the creativity levels of the students of experimental and control groups, the scale called "How Creative Are You" developed by Whetton and Cameron [11] and adapted into Turkish by Aksoy [12] has been utilized. The phrases in the mentioned scale have been translated to Turkish by Aksoy [12] and in line with the purpose of the research, each of them has been reviewed and determined whether to be included in the scale

Table 1. Characteristics of the gaming forms used

Game Name	Playground	Game tools	Game duration	Purpose and educational value of game
Who is faster	Hall and schoolyard	-	3-4 repetitions	Improves reaction time and attention
Potato planting	Hall and schoolyard	Handball, chalk	2-3 repetitions	Improves agility, skills and attention
Running by numbers	Hall and schoolyard	Medicine ball	2-3 repetitions	Improves attention, concentration and agility
Siege	Hall and schoolyard	Handball	2-3 repetitions	Improves attention and agility
Starling nest	Hall and schoolyard	Chair	2-3 repetitions	Improves attention and reaction
Wolf in the pasture	Hall and schoolyard	-	2-3 repetitions	Improves attention and determination
Assault	Hall and schoolyard	-	2-3 repetitions	Improves attention and agility
Best hunter	Hall and schoolyard	-	2-3 repetitions	Improves attention, agility and skills

or not. After examining its items, the scale has been arranged as a 40 item preliminary application scale. Creativity scale characterizes the traits, attitudes, values, motives and interests of the students. The scale was developed also in order to determine the highly creative personalities of the students. While three choices as A) agree, B) undecided and C) disagree have been presented to choose among for 39 phrases intended to determine students' creativity characteristics, 40th question is not in a grading form. In this final question 54 adjectives have been listed. Point values of these adjectives vary between 0 and 2 points. Point values of these adjectives have also been considered in calculating the creativity scores of the students [12].

In analyzing and interpreting data, the matter that whether research data have a normal distribution has been determined before actual testing by means of a one-sample Kolmogorov-Smirnov Test (Table 1). As presented in the table, in conclusions of the one-sample Kolmogorow-Smirnov Test, conducted in order to determine whether the scores obtained from the sample have a normal distribution, it has been determined that the distributions are normal, and then the significance has been taken as $p < 0.05$ by using Paired Sample t Test. In order to evaluate the data and obtain the calculated values, SPSS (Statistical package for social sciences) program has been utilized and (Cronbach Alpha) has been found out to be 0.72. As shown in Table 2, $p > 0.05$ and this means that the data are suitable for normal distribution.

Table 2. Results of the one-sample kolmogorov-smirnov test conducted for determining the normal distribution of the scores obtained from the scale

	Creativity
N	251
$\bar{X}$	38.3347
Ss	7.2055
Kolmogorov-Smirnov Z	0.836
p	0.487

3. Findings

As they are also shown in Table 3, the following conclusions have been obtained from examining the distribution regarding the pre test final test scores on the effects of educational game activities on the creativity levels of students attending to elementary schools.

Table 3. Results of paired samples t test examining the effects of educational game activities on the creativity levels of students attending to elementary schools

		n	$\bar{X}$	SD	t	p
6th grade	Pre-test	99	37.6465	7.1945	-7.212	0.000
	Final test	99	43.7071	7.1987		
7th grade	Pre-test	72	37.9583	7.4823	-5.660	0.000
	Final test	72	43.8889	6.6725		
8th grade	Pre-test	80	39.5250	6.9007	-6.699	0.000
	Final Test	80	45.1750	8.2964		

A significant difference between the educational game activities and creativity levels of the students attending to 6th grade has been determined (t value = -7,212; $p = 0.000 < 0.05$). While

the pre-test score average of elementary school students has been found out to be ($\bar{x}$ = 37.6465), final test score averages has been determined as ($\bar{x}$ = 43.7071).

A significant difference between the educational game activities and creativity levels of the students attending to 7th grade has been determined (t value = -5.660; p = 0.000 < 0.05). While the pre-test score average of elementary school students has been found out to be ($\bar{x}$ = 37.9583), final test score averages has been determined as ($\bar{x}$ = 43.8889).

A significant difference between the educational game activities and creativity levels of the students attending to 8th grade has been determined (t value = -6.699; p = 0.000 < 0.05). While the pre-test score average of elementary school students has been found out to be ($\bar{x}$=39.5250), final test score averages has been determined as ($\bar{x}$=45.1750).

4. Discussion and conclusion

Examining the effect of educational games on the creativity levels of elementary school students have showed that there is a significant difference between the educational game activities and the creativity levels of students attending 6th grade (p < 0.05). Pre-test score average of elementary school students has been found out to be ($\bar{x}$ = 37.6465), while their final test score average has been determined to be ($\bar{x}$ = 43.7071). According to these results, creativity levels of 6th grade students have enhanced after playing educational games.

A significant difference between the educational game activities and creativity levels of the students attending to 7th grade has been determined (p < 0.05). Pre-test score averages of 7th grade students have been found out to be ($\bar{x}$ = 37.9583), while their final test score average has been determined to be ($\bar{x}$ = 43.8889). According to these findings, creativity levels of 7th grade students have improved after playing educational games. These result shows us how games reflect both emotional and cognitive processes together, how these processes influence each other and that games have an educational quality.

A significant difference between the educational game activities and creativity levels of the students attending to 8th grade has been determined (p < 0.05). Pre-test score average of 8th grade students has been found out to be ($\bar{x}$ = 39.5250), while their final test score average has been determined to be ($\bar{x}$ = 45.1750). According to these results, creativity levels of 8th grade students have enhanced after playing educational games. This result indicates that mental development can not be considered separately from physical, social and psychological development, that all these can be developed and supports each other, and that the mental activities especially learned and developed with games affect children's creativity levels.

In the study conducted by Socha et al. [13] a relation between game, skills and divergent thinking has been founded. The study carried out by Runco [14] has manifested a significant relation between children's different thought structures and games. In another study, Fabes et al. [15] has found a significant relation between games and children's emotional levels.

In a study conducted on 61 students, Dillon [16] has examined the relation between games, creativity and emotional levels of students and has found a significant and positive relation between games and creativity. A study conducted on children of ages between 6 to 10 by Russ and Schafer [17] a significant relation between games, emotional skills and creativity levels have been found to exist. In the study carried out by Wyver and Spece [18] has determined that different game forms are in relation with different types, that it is related with semantic thinking in problem solving and that children educated through games have higher divergent thinking and problem solving skills than the children not educated by means of games.

In a study conducted by Duncan and Tarulli [19] no significant relation between games and the cognitive levels of preschool children could be found. The reason why such relation has not been found lies in the fact that games vary with the creativity levels of children.

In another study conducted by Kaugars and Russ [20] 33 preschool children's daily gaming behaviors, and their thoughts about emotional expression and skills have been measured with the implementation of a game scale applied in 5 minutes. In conclusion of the study a significant relation between children's daily games and their creativity levels have been found.

In the mentioned study of Russ and Peterson [21] 31 of the 121 children attending to 5th and 6th grades have participated in the research and alternative tests have been conducted in a period longer than 4 years in order to display the children's creative skills, first APS test has been conducted then games have been implemented, and in conclusion it has been determined that there is a highly positive relation between playing games and imagination.

Another study carried out by Seja and Russ [22] the connection between games and creativity of preschool children has been examined, teachers of 33 children between the ages of 4 and 5 have been inquired and a

significant relation between games and children's creativity levels has been found. Also according to this study cognitive level and imagination points are not related with creativity but with daily gaming behaviors.

In his study, Shmukler [23] has carried out a longitudinal research and has stated as a conclusion that games affect creativity at preschool period. In the study conducted by Russ and Cooperg [24] 49 of the 121 students attending to 11th and 12th grades have been subjected to alternatively used tests for adults. A significant relation between playing games and imagination has also been exhibited in this study.

Clark et al. [25] have conducted a 3-years study on preschool students and have located a relation between games and different thinking styles. In their studies Rubin et al. [26] have found a relation between children's game processes, their emotional relations and creativity levels. In the study conducted by Russ and Grossman [27] on 61 2nd grade students, it has been determined that there is a significant relation between games and thinking processes, especially between emotional expression and divergent thinking.

In his study Dansky [28] has asserted that the ideas and free combination processes of differently considered objects that will ease theoretical reasons are similar to game related creative thinking processes and has found out that the basic explanatory mechanism between games and creativity is the cognitive variables, by explaining that taking a place in symbolic conversions aids creativity.

In the study carried out by Isen et al. [29] it has been determined that effective games have a significant relation with children's creativity levels. In their studies Kim et al. [30] have given education through games to children, and thematic games have been modeled by teachers in 20 minutes sessions for 10 days. In conclusion of this study, the creativity levels of the participating children have been observed to be increased.

In the study conducted by Hartman and Rollett [31] children have been asked to play games for 4 hours in a week throughout a full educational year according to the curriculum implemented for elementary schools in Austria, and by the end of the educational year, it has been observed that divergent thinking, or in other words creativity level, is higher for the group that played games throughout the year, in comparison with the other group.

In his study, Dasky [32] has focused on games played during literature classes, games have been played as part of daily activities for sessions of 3 to 6 weeks, and the imagination levels of the children have been witnessed to be enriched by the end of the study.

In the study conducted by Slade and Wolf [33] effects of games on both cognitive and affective characteristics have been examined, and it has been determined that games are among cognitive and affective functions and that games are important in terms of the development of cognitive characteristics.

In the study conducted on 95 students attending 1st, 2nd and 3rd grades, Dangelo [34] has found that students' cognitive and affective levels are in relation with their imaginary game levels. Howard et al. [35] have conducted a study on 52 children of ages of 6 and 7, have randomly created two groups from the children, have exercised one of the groups and allowed them to play with modeling clay for 25 minutes, while the other group have been given a random article and later both groups have supplied with drawing materials and asked to make drawings. This procedure has been applied for a couple of days and 7 trainee teachers and 3 lecturers evaluated that materials used by each children and their drawings. It has been determined that the children included in the group subjected to the exercise have higher levels of creativity than the children of the other group.

Pepler and Ross [36] have conducted a study on 64 preschool children focusing on convergent thinking and game levels. As part of the study the children have been allowed to play with different materials and later they have been asked to answer questions in order to solve a given problem. The children who answered the question in distinctive way have been determined and the convergent thinking skills of children who played games have been found out to be higher.

Mullineaux and Dilalla [37] have conducted a study on 50 male and 59 female children, a total of 109 between the ages of 10 to 14. Participating children have been matched by their ages and genders in 5-children groups and have been allowed to play for 20 minutes in game room. Children's parents have been asked to fill in a questionnaire and it has been understood that the parents contact with their 11 years old children. In conclusion it has been determined that the parents can not guess on their children's gaming and behavioral models, and that early role-playing behaviors are important in guessing the creativity levels.

Bundy et al. [38] have placed a video at the school yard of an elementary school in Western Australia for a period of 11 weeks, in order to test the behaviors of 20 children aged between 5 to 7, have interviewed the children's teachers regarding their gaming and creativity levels and in conclusion have found that social children having interest towards the games are more creative.

In a study conducted on 90 students, Hutton and Sundor [39] have examined the effects of video games on the creativity levels of youngsters, and it has been concluded that as the cognitive levels of the students improve also their creative levels improve.

In the study carried out on 30 male and 30 female students, Blanchette et al. [40] have examined the effects of aerobic exercise on the creativity levels of the students and have found that the students' creativity levels

improve after aerobic exercises.

Pagona and Costas [41] have examined the effects of elementary school students' motor skills on their creativity levels. Students' motor movements have been recorded throughout a gym class for 45 minutes. Later all findings pertaining to physical training program have been analyzed with systematical methods and it has been determined that the students' creativity levels increase in line with their motor skills. All these studies show parallelism with the findings of the study we have conducted.

In this study, it has been determined that educational games affect the creativity levels of elementary school students. According to these findings, it has been understood that children can better express themselves while playing games and that they are more free and creative in game environment. Due to this reason, utilization of games in order to develop student's creativity skills in educational environments surfaces as an indispensable necessity.

Creation of imaginary play scenes, or play scenes similar to reality, during the game, enables children to make decisions and manifest various facts and problems. This enables the children to utilize their cognitive skills for answering questions and ensures their cognitive development level is improved against new situations and questions. Also, since most of the games are imaginative and therefore urge creative force, they will provide positive contribution to the creativity skill in children. At this point creativity skills of the individuals will also develop. This is because of the fact that creativity is to reach something new from something old; it is to find new paths to solution and to regard things with a new and original viewpoint. Also, it is clear that the individuals' creativity skills can be manifested easier and more systematically, if games are designed in a planned and purposeful way [42].

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