

*Full Length Research Paper*

# Investigation of the imagery and creativity of the 7th grade students using guided discovery method

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The aim of this study is to investigate the imagery and creativity of the 7th grade students using guided discovery method. The research group was made 77 (age=12.7922+0.52158) 7th grade students, 37 females and 40 males studying in Imam Hatip Secondary School, Konya province, Ereğli county. To achieve the purpose of the research, adaptation-innovation inventory creativity scale and sport imagery questionnaire scale were used for data collection. Experimental design consisting of pre-test and post-test was used in the research during the research. Students were given experimental work for 10 weeks. In the analysis and assessment of the data, Kolmogorov Smirnov test, paired samples t test and two Way Anova for mixed measures test, were used and significance was taken as  $p < 0.05$ . For the evaluation of the data and the determination of the calculated values, SPSS package program was used. As a result of this study; there was a significant difference between level for imagery and creativity of the 7th grade students in favor of the post-test according to the guided discovery method. It was found that the level of imagination and creativity of secondary school students participating in the experimental study showed a significant difference after the experiment; that is, in different treatment groups the repeated effects of the factors of repeated measures on imagination and creativity were meaningful.

**Key words:** Guided discovery, creativity, imagery.

## INTRODUCTION

With the advances in technology as well as the rapid advances in science, the importance of physical education in human life has gradually increased and physical education has become an important area where the goals of physical education can be gained. Physical education is an important discipline within our education system that enables individuals to develop physically,

mentally, emotionally and socially (Sunay and Tuncel, 1998). It is thought that physical education aims and achievements can be contributed to the individual's own life by using a good and effective teaching method. Büyükkaragöz and Çivi (1997) stated that non-methodical activities produce random and random results, but that if the appropriate and good method is chosen, it will be

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possible to reach the targets in a short time.

Tamer and Pular (2001), stated that a good physical education and sports teaching method is a method that is suitable for the characteristics of teaching activity and enables all students to participate and move to the highest level of activity. It can be said that the directed invention method is one of these methods. Since with the directed invention method, students can perform mental activities in the analysis, synthesis and evaluation stages at the highest level (Temel and Avşar, 2008).

In this method, the teacher asks a variety of questions to guide students to a predetermined goal (movement, concept, principle, etc.). He asks them one after another, observing a meaningful sequence. Before the students answer one question, another question is not passed. Thus, the teacher guides the students patiently and skillfully in finding the right answer (Tamer and Pular, 2001). The essence of this method is to create a cognitive discomfort in the student or athlete, and the student or athlete needs to get rid of this situation and find solutions (<http://www.bedenegitimci.org>).

According to Hançerlioğlu (2000), it creates a form of creative thinking that brings new solutions to problems, seeks innovation, and creates inventive, original thoughts. Creativity, on the other hand, can be defined as creating new concepts or thoughts with our observations, knowledge, experience or thoughts from the relationships between the existing concepts (Yıldırım, 1998).

The process of creativity is evaluated as “making and being” by adding the new experiences to the old experiences and by using the information obtained previously (Sternberg, 2005). Creativity, in more detail, is to break down existing patterns, to be open to the lives of others, to go out of the ordinary, to take a step towards the unknown, to break the imposed line of thought and to create a new line of thought to provide a different alternative solutions to a problem, to follow the path of others to find something new that leads to other things, to establish a new relationship, to put forward a new idea, to invent an new technique or method, and to find a tool or device that is useful to people (Rıza, 1999).

Imagination, which is an event related to the will that is also used in the revitalization of a technique or the repetition of it, is also applied to sporting skills (White and Hardy, 1998, cited; Elçi, 2014). Imagination is a way of thinking and imagination has creativity. In the case of free thinking, images come to life in memory one after another.

Images or designs are further abstracted, joined together, subtracted, simulated, their qualities changed, new formations and syntheses occur, which is the event of creative thought. To achieve this, the stored information and wealth of life in the brain is used (Erkuş, 1994, cited; Ağılönü, 2014).

Parallel with the level of development of societies, there is a differentiation in the needs of individuals. Teaching programs is also a factor affected by this change.

Nowadays it is seen that the multi-faceted development of individuals is at the forefront of the teaching programs. In the restructured curricula, the students are expected to learn by doing, living and practicing (Şirinkan and Erciş, 2009). The participation of more sensory organs of the students in the learning process will increase the permanence and effect of learning at that rate. The active participation of students in physical education and sports courses in the curriculum, finding the applications by designing themselves, and the use of measurement and evaluation tests that can control themselves will increase the efficiency of the student in multidimensional development (Şirinkan and Erciş, 2009). In scientific studies, it was found that the methods in which the students were active are more effective. Significant results were obtained in determining the effect of student-centered methods on achievement and retention in Demirhan's skill learning in sports (Şenışık et al., 2007; cited; Şirinkan and Erciş, 2009).

Mosston and Ashworth (2008) conducted a number of international researches on teaching styles and compared these styles with each other. The findings of these studies have also produced various results (Papaioannou et al., 2012; Kolovelonis et al., 2011; Zeng, et al., 2009, cited in Saraç and Muştu, 2013). Other literatures from scientific studies, such as Böke (2016), were reviewed. As a result of the study on the effect of using different special teaching methods on the cognitive, affective and psychomotor behaviors of secondary school 7th grade students in physical education classes, it has been seen that the most effective method for psychomotor field development is exercise method. The most effective methods for cognitive field development are self directed methods and invention methods. And the most effective method for affective field development is participation method.

In her research, Yıldız stated that the methods that teachers prefer more in physical education classes are paired work, command and practice methods; while the least preferred methods of teachers were personal student design, directed invention and self-learning methods (Yıldız, 2012, cited in Böke, 2016).

Çelik (2011), in his study, investigated the effectiveness of different teaching methods in basketball teaching on the 6th grade students. The researcher examined the cognitive, affective and psychomotor scores of the students. When the research results were examined and the students' development in the cognitive field examined, it was revealed that the directed invention method shows a higher development than the command method (Sural, 2015). The method of invention, which is guided by the teaching methods used in physical education and sports, is seen as an important concept in the development of high-level mental skills of students and participation in high-level activities (Temel and Avşar, 2008). The aim of this study is to examine the effects of 7th grade students on the level of imagination and

creativity in revealing their high level cognitive skills.

## METHODOLOGY

### Research group

The research group comprised 77(age=12.7922+0.52158) 7th grade students studying in Imam Hatip Secondary School, Konya province, Ereğli county; 37 females and 40 males.

### Data collection tools

To achieve the purpose of the research, "Adaptation-Innovation Inventory Creativity Scale" developed by Kirton (1999) and "Sport Imagery Questionnaire Scale" developed By Hall and et al. (1999) adapted to Turkish by Kafkas (2011) were used for data collection.

### Research model

Figure 1 shows that students were given experimental work for 10 weeks and Table 1 shows Experimental design used in the research. Experimental design consisting of pre-test and post-test was used in the research; students were given experimental work for 10 weeks. During this time, the subjects included at the annual plan on physical education course were processed by guided discovery method. Then post-test was applied to analyze the level of development of the students' creativity and imagery.

### Data analysis of

In the analysis and assessment of the data, Kolmogorov Smirnov test, Paired Samples T Test, Two Way Anova for mixed measures test, was used and significance was taken as  $P < 0.05$  and in the evaluation of the data and the determination of the calculated values, and SPSS package program was used.

## FINDINGS

The test results were examined in Table 2. It was found that the physical education courses according to the directed invention method showed a significant difference in the creativity levels of 7th grade students before and after the experiment ( $t: -11.211$ ,  $p < 0.05$ ). As a result of this difference, the creativity pre-test score mean ( $\bar{X} = 94.88$ ), creativity post-test mean score ( $\bar{X} = 131.25$ ) were found.

If the test results are examined in Table 3, It was found that the physical education courses conducted according to the directed invention method showed a significant difference between the 7th grade students' specific cognitive sub-dimensions before and after the experiment ( $t: -11.604$ ,  $p < 0,05$ ). As a result of this difference; While specific cognitive pre-test point mean ( $\bar{X} = 25.54$ ), specific cognitive post-test mean score ( $\bar{X} = 34.14$ ) was found.

If the test results are examined in Table 4; It was found that the physical education courses conducted according to the directed invention method showed a significant difference between the general cognitive sub-dimensions

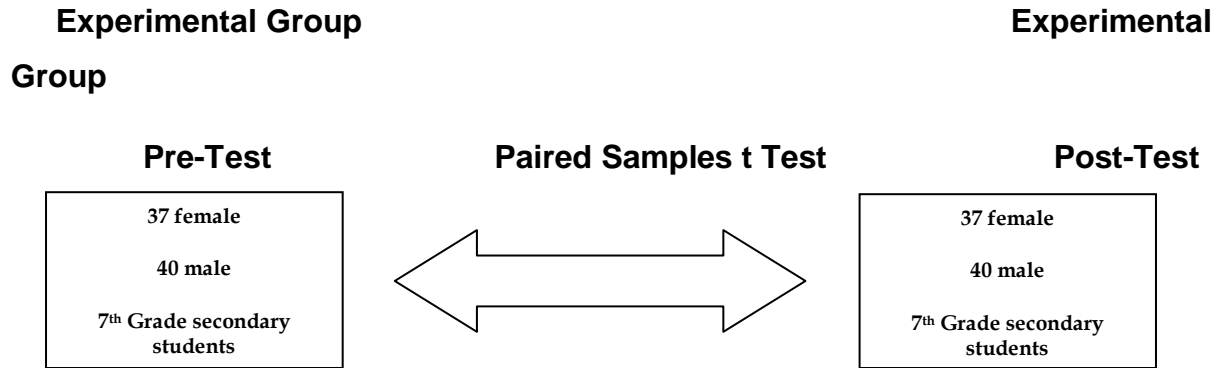
of 7th grade students before and after the experiment ( $t: -9.014$ ,  $p < 0.05$ ). As a result of this difference, general cognitive pre-test point mean was ( $\bar{X} = 8.96$ ) and general cognitive post-test mean score ( $\bar{X} = 12.10$ ) were found. From the test results examined in Table 5, it was found that the physical education courses conducted according to the directed invention method showed a significant difference between the 7th grade students' pre-experiment and post-experiment motivation sub-dimensions ( $t: -11.863$ ,  $p < 0.05$ ). As a result of this difference; motivation pre-test point mean ( $\bar{X} = 12.02$ ) and motivation post-test mean score ( $\bar{X} = 17.09$ ) were found.

According to the method of the invention, which is directed according to the gender variable, the mean creativity pre-test scores of 7th grade male students were 95,9000, while the average post-test scores were 136,8500. The mean score of creativity pre-test of female students was 93,7838 and the average score of post-test was 125.2162 (Table 6).

It was found that the physical education courses conducted according to the directed invention method showed a significant difference in the creativity levels of the students before and after the experiment. ( $F: 2.181$ ,  $p < 0.05$ ). According to the basic effect of the measurement, a significant difference was found in terms of gender variable according to the mean scores of creativity pre-test and post-test of 7th grade students ( $F: 126.161$ ,  $p < 0.05$ ) (Table 7). From Table 8, according to the method of the invention directed by gender variable, the mean of the 7th grade male students' specific cognitive pre-test scores was 25,6500; while the average of post-test scores was 34,8250. The mean score of creativity pre-test of female students was 25,4324 and the average of post-test was 33,4054.

From Table 9 it was found that the physical education courses conducted according to the directed invention method did not show a significant difference in the level of special cognitive subscales from the pre-experiment and post-experiment imagination levels of the students ( $F: 0.654$ ,  $p > 0.05$ ). According to the basic effect of the measurement, there was a significant difference between the level of imagination of 7th grade students in terms of gender variable according to the special cognitive subscale pre-test and post-test mean scores ( $F: 133.101$ ,  $p < 0.05$ ). From Table 10, using the method of the invention directed by gender variable, the mean cognitive pre-test scores of 7th grade male students were 9,5500; whereas the mean post-test scores was 12,4750. The mean score of general cognitive pre-test of female students was 8,3243, while the mean of post-test was 11,7027.

It was found that the physical education courses conducted according to the directed invention method did not show a significant difference in the general cognitive sub dimension levels of the students' imagination levels before and after the experiment ( $p > 0.05$ ). According to the basic effect of the measurement, there was a significant difference between the level of imagination of



**Figure 1.** Students were given experimental work for 10 weekly.

**Table 1.** Experimental design used in research.

Group	Pre-test	Experimental design	Post-test
Experimental group	T1 T2	The subjects included at the annual plan on physical education course were processed by guided discovery method	T1 T2

T1: Kirton (1999) Adaptation-Innovation Inventory Creativity Scale; T2: Sport Imagery Questionnaire Scale.

**Table 2.** According to the guided discovery method of the 7th grade students; pre-test and post-test scores showing indicative creativity levels paired sample t test results.

	N	Mean	Std. deviation	t	p
Creativity pre-test	77	94,8831	24,47124	-11.211	0.000
Creativity post-test	77	131,2597	18,59924		

**Table 3.** According to the guided discovery method of the 7th grade students; pre-test and post-test scores showing indicative special the cognitive sub-dimension levels paired sample t test results.

	N	Mean	Std. deviation	t	p
Special cognitive pre-test	77	25,5455	6,02090	-11.604	0.000
Special cognitive post-test	77	34,1429	4,17925		

**Table 4.** According to the guided discovery method of the 7th grade students; pre-test and post-test scores showing general cognitive sub-dimension levels paired sample t test results.

	N	Mean	Std. deviation	t	p
General cognitive pre-test	77	8,9610	2,97994	-9.014	0.000
General cognitive post-test	77	12,1039	2,11252		

7th grade students in terms of gender and general cognitive sub-dimension pre-test and post-test scores (F:4.641,  $p < 0.05$ ) (Table 11).

In line with the invention method guided by gender variable, the mean motivation pre-test scores of 7th grade male students were 12,8000, while the average

**Table 5.** According to the guided discovery method of the 7th grade students; pre-test and post-test scores showing level of sub-dimension motivation paired sample t test results.

	<b>N</b>	<b>Mean</b>	<b>Std. deviation</b>	<b>t</b>	<b>p</b>
Motivation pre-test	77	12,0260	3,37940	-11.863	0.000
Motivation post-test	77	17,0909	2,60153		

**Table 6.** According to the gender variable, to the guided discovery method of the 7th grade students; descriptive statistical Analysis results about the level of creativity.

	<b>Gender</b>	<b>Mean</b>	<b>Std. deviation</b>	<b>N</b>
Creativity pre-test	Male	95,9000	27,90074	40
	Female	93,7838	20,45746	37
Creativity post-test	Male	136,8500	15,94791	40
	Female	125,2162	19,55780	37

**Table 7.** According to the gender variable, to the guided discovery Method of the 7th grade students; about the pre-test and post-test creativity level of two-way anova test results.

<b>Source</b>	<b>Sum of squares</b>	<b>df</b>	<b>Mean square</b>	<b>F</b>	<b>p</b>
Between groups	40999,714	76			
Group(gender)	1816,964	1	1816,964	3,478	0.046
Error	39182,750	75	522,437		
Within groups	81153,951	77			
Assumed pre-test and post test	50350,912	1	50350,912	126,161	0.000
Group* Assumed	870,548	1	870,548	2,181	0.044
Error	29932,491	75	399,100		
Total	122153.665	153			

**Table 8.** According to the gender variable, to the guided discovery method of the 7th grade students; descriptive statistical analysis results about the pre-test and post-test level of special cognitive subscales.

	<b>Gender</b>	<b>Mean</b>	<b>Std. deviation</b>	<b>N</b>
Special cognitive pre-test	Male	25,6500	5,79810	40
	Female	25,4324	6,33132	37
Special cognitive post-test	Male	34,8250	4,67337	40
	Female	33,4054	3,48377	37

post-test scores were 17,4250. On the other hand, the average pre-test score of female students was 11,1892 and the mean post-test score was 16,7297 (Table 12). From Table 13, it was found that there was a significant difference between the pre-test and post-test motivation scores of the 7<sup>th</sup> grade students of physical education

courses according to the gender-directed invention method ( $F:1.150, p<0.05$ ). There was a significant difference in the motivation subscale of the 7th grade students according to the gender variable according to the pre-test and post-test mean scores of the physical education course according to the directed invention

**Table 9.** According to the gender variable, to the guided discovery method of the 7th grade students; about the pre-test and post-test level of special cognitive subscales two-way ANOVA test results.

Source	Sum of squares	df	Mean square	F	p
Between groups	2476,291	76			
Group(gender)	25,759	1	25,759	0.788	0.377
Error	2450,501	75	32,673		
Within groups	4432,224	77			
Assumed pre-test and post test	2825,964	1	2825,964	133,101	0.000
Group* Assumed	13,886	1	13,886	0.654	0.421
Error	1592,374	75	21,232		
Total	6908.515	153			

**Table 10.** According to the gender variable, to the guided discovery method of the 7th grade students; descriptive statistical analysis results about the pre-test and post-test level of general cognitive subscales.

	Gender	Mean	Std. deviation	N
General cognitive pre-test	Male	9,5500	2,55152	40
	Female	8,3243	3,30029	37
General cognitive post-test	Male	12,4750	2,28695	40
	Female	11,7027	1,85390	37

**Table 11.** According to the gender variable, to the guided discovery method of the 7th grade students; about the pre-test and post-test level of general cognitive subscales two-way ANOVA test results.

Source	Sum of squares	df	Mean square	F	P
Between groups	658,338	76			
Group(gender)	38,364	1	38,364	4,641	0.034
Error	619,974	75	8,266		
Within groups	737,56	77			
Assumed pre-test and post test	381,846	1	381,846	80,959	0.000
Group* Assumed	1,975	1	1,975	1,419	0.519
Error	353,739	75	4,717		
Total	1395,898	153			

method ( $F:4.,804, p<0.05$ ).

## DISCUSSION

In this study examined the effect of 7th grade students' level of imagination and creativity in revealing high level cognitive skills. It was found that the physical education courses according to the directed invention method showed a significant difference in the creativity levels of 7th grade students before and after the experiment. In the guided method of invention, the ability to direct the student to the correct answer by asking the questions prepared beforehand, from simple to complex can be discussed. It can be said that there is a problem in the

minds of students in the face of the questions asked. In order to solve this problem, according to their readiness, the students can either explain an existing situation or create a new situation. It can be said that the creation of a new or different concept is related to creativity. When the related literature is examined, it is seen that there are many studies on creativity, and no studies dealing with creativity have been found with the directed invention method. For example, Kadayıfçı (2008), who conducts research on creativity, examines the effects of a teaching model that supports creative thinking on the conceptions, images, divergent thoughts and scientific creativity of 9th grade chemistry students in comparison to traditional teaching approach. It is stated that the average scores are in the range of 60-70 points (Kılıç and Tezel, 2012).

**Table 12.** According to the gender variable, to the guided discovery method of the 7th grade students; descriptive statistical analysis results about the pre-test and post-test level of general motivation subscales.

	Gender	Mean	Std.deviation	N
General motivation pre- test	Male	12,8000	3,12311	40
	Female	11,1892	3,48678	37
General motivation post-test	Male	17,4250	2,30815	40
	Female	16,7297	2,87372	37

**Table 13.** According to the Gender Variable, to the guided discovery method of the 7th grade students; about the pre-test and post-test level of general motivation subscales two-way ANOVA test results.

Source	Sum of squares	df	Mean square	F	P
Between groups	848,974	76			
Group(gender)	51,108	1	51,108	4,804	0.031
Error	797,866	75	10,638		
Within groups	1526,459	77			
Assumed pre-test and post test	993,121	1	993,121	141,798	0.000
Group* assumed	8,056	1	8,056	1,150	0.287
Error	525,282	75	7,004		
Total	2375.433	153			

This finding supports the research result. Again, Öztunç (1999), in his study, examined the relationship between the fifth grade students' creative thinking abilities and their families' educational and economic status and their attitudes towards their children. It was concluded that the high level of parents' education was effective on the creative thinking of children. This study supports the research finding of others (Öztunç 1999; Kılıç and Tezel, 2012). Yılmaz (2008), the successful and unsuccessful seventh grade students' reading strategy levels and creativity levels used in the Turkish course aims to examine the relationship between; at the level of creativity, it was found that the average of successful students' creativity scores were higher than the average of unsuccessful students (Kılıç and Tezel, 2012).

It was found that the physical education courses conducted according to the directed invention method showed a significant difference between the 7th grade students' specific cognitive sub-dimensions before and after the experiment. The special cognitive dimension is thought to be more effective in learning a technical skill. When a technical skill is taught using the directed invention method, students can experience meaningful learning by understanding the technique or logic by adopting the event. It can be said that studies dealing with specific cognitive sub-dimensions are possible in literature. This finding is consistent with that of Ille and Cadopi (1999) who used the cognitive imagery of young athletes gymnastics to increase the memory range of gymnastics performance and thus showed that the

performance of gymnasts perform more accurately (Tiryaki and Kızıldağ, 2012). Weigand et al. (2007), examine the effect of the athletes use of imagination competition level (master / beginner) and skill type (open / closed), and found that it has effect on the competition level and skill type. The analyses showed that master athletes used their Special Cognitive and General Cognitive imagery more than novices (Elçi, 2014).

It was found that the physical education courses conducted according to the directed invention method showed a significant difference between the general cognitive sub-dimensions of 7th grade students before and after the experiment. It can be stated that cognitive dimension is effective in learning complex and difficult skills. By using the directed method of invention, a complex situation is revealed and the student is asked to train his / her high level cognitive skills and he / she can be said to reach a solution.

General cognitive sub-dimension studies are encountered in the literature. For example; In the study conducted by Abma et al. (2002) in order to examine how high and low level athletes and field athletes differ in their imagination content and imagination abilities, profile analyzes showed that each athlete with high degree of confidence in sports has less self-confident athletes category. Motivational General Stimulation, Motivational General Mastery, Motivational Special Imagination, General Cognitive and Cognitive imagery) were found to use significantly more (Elçi, 2014).

It was found that the physical education courses

conducted according to the directed invention method showed a significant difference between the 7th grade students' pre-experiment and post-experiment motivation sub-dimensions. Motivation can be defined as the desire to do something or the things that enable us to act. In the directed invention method, it can be stated that students are activated by asking questions. Students can be mentioned that their self-confidence develops, their motivation increases and they are happy with the appreciation of the teacher. In the literature, it is possible to come across studies dealing with motivation. For example, Martin and Hall (1995), a study parallel with this study, found that golfers who started to use visualization were better connecting to training programs than other groups that did not use visualization (Tiryaki and Kızıldağ, 2012).

## Conclusion

Paivio (1985) concluded that athletes using Motivational Special Imagination are better at maintaining goal-related tasks (such as training). In a study by Feltz and Riessinger (1990), it was found that the self-efficacy perceptions of athletes using this type of imagination increased (Aldemir et al., 2014).

According to the method of the invention, which is directed according to the gender variable, the average creativity pre-test scores of 7th grade male students were 95,9000, while the average post-test scores were 136,8500. However, the average score of creativity pre-test of female students was 93.7838, the average score of post-test was 125.2162.

In other words, it has been observed that both male and female students have improved creativity scores. It can be said that there is an improvement in the creativity of male and female students because of the continuous mental activity in the face of the questions and the constant thinking about new solutions. Since it can be stated that creativity requires high level of mental activity creativity studies are available in literature. Kılıç and Tezel (2011), from their research on students' scientific creativity levels, significant differences were found between the groups according to gender, the type of school they studied (public school, private school), parents' education, family monthly income, use of tools and equipment at home and having their own room (Kılıç and Tezel, 2012). In the study of Gülel (2006), which aims to determine the creativity levels of prospective classroom teachers according to their own perceptions, it has been found that the creativity levels of female students studying at Pamukkale University Faculty of Education Classroom Department are higher than male students (Kılıç and Tezel, 2011). Özben and Argun (2005) study on the students of Dokuz Eylül University Faculty of Education compared the creativity levels of university students according to some variables.

According to the findings of the study, it was found that the level of fluency and flexibility was higher than the creativity levels of girls compared to boys. In the originality dimension, no differentiation was found between boys and girls (Kılıç and Tezel, 2012). The study findings do not show parallelism with the sample group and is thought to be due to the fact that the study area.

It was found that the physical education courses conducted according to the directed invention method showed a significant difference in the creativity levels of the students before and after the experiment. According to the basic effect of the measurement, a significant difference was found in terms of gender variable according to the mean scores of creativity pre-test and post-test of 7th grade students. Looking at the gender variable, it has been found that the directed invention method improves the creativity of both boys and girls.

From this method, both girls and boys can be said to have made a lot of mental effort. Even if there is a difference in the development of girls and boys during this period, it can be stated that the development levels are similar when viewed from the perspective of creativity.

It is seen that these standards will not be possible only with physical education practices focused on skill development. The importance of the harmony between teaching processes (aim, application, measurement and evaluation) in achieving teaching objectives has been revealed in many previous studies (Cohen, 1987; Anderson, 2002; James et al., 2008, İnce and Hünük, 2010).

According to the method of the invention directed by gender variable, the average of the 7th grade male students' specific cognitive pre-test scores was 25,6500, while the average of post-test scores was 34,8250. The mean score of creativity pre-test of female students was 25,4324 and the average of post-test was 33,4054. For higher cognitive dimensions of male students, it can be said that male students learn more of special cognitive technique. In this age, it can be said that male students are more oriented towards technical skills. The reason for the increase in the creativity of female students; it is thought that girls give more importance to mental processes rather than practice. In Aslan (2014) study, the effect of athletes in different age categories on depression levels and imagery styles, there was no significant difference in cognitive imagery scores according to gender. There was a statistically significant difference in motivational imagery scores according to gender. A statistically significant difference was found in terms of motivational general arousal scores in terms of gender. It was observed that there was no significant difference in terms of motivational general mastery scores according to gender (Aslan, 2014).

It was found that the physical education courses conducted according to the directed invention method did not show a significant difference in the level of special



cognitive subscales from the pre-experiment and post-experiment imagination levels of the students ( $p>0.05$ ). According to the basic effect of the measurement, there was a significant difference between the level of imagination of 7th grade students in terms of gender variable according to the special cognitive subscale pre-test and post-test mean scores ( $p<0.05$ ).

Regarding imagination, mental stimulation will be discussed as well. In the directed invention method, before answering the questions, male and female students first create some images in their minds. They can be said to express their dreams using their creativity. In the light of this study, Abma et al. (2002), profile analyses high and low level athletes confident in track and field athletes in order to examine how they differ in imagery content and imagination abilities, profile analysis of high degree of self-confident athletes in the sport of less self-confident athletes for each category of imagination (Motivational General Stimulation General Mastery, Motivational Special Imagination, General Cognitive and Cognitive Imagination) (Erdoğan, 2009).

According to the method of the invention directed by gender variable, the average cognitive pre-test scores of 7th grade male students were 9,5500; whereas the average post-test scores were 12,4750. The average score of general cognitive pre-test of female students was 8,3243, while the average of post-test was 11,7027. The general cognitive dimension is the development of performance, technical or tactical skills. It can be said that female and male students have increased their general cognitive scores to a level where they can make technical, tactical or performance evaluations. It was found that the physical education courses conducted according to the directed invention method did not show a significant difference in the general cognitive sub-dimension levels of the students' imagination levels before and after the experiment ( $p>0.05$ ).

According to the basic effect of the measurement, there was a significant difference between the level of imagination of 7th grade students in terms of gender and general cognitive sub-dimension pre-test and post-test scores. It can be said that female and male students use imagination skills to develop new strategies and tactics when evaluating any performance, setting up games. There are a limited number of studies on imagination in the literature. Ağılönü (2014), in the study of dreaming and problem solving skills of athletes engaged in different sports branches, the cognitive imagery values of the imagination sub-dimensions and the values of gender, age and sports year, motivational special imagery values and the year of doing sports and cognitive imagery values, cognitive imagination and motivational special imagery, motivational general mastery values with gender, year of doing sports, a positive significant relationship between cognitive imagery, motivational special imagery and motivational general imagery variables were discovered; and there was a negative

correlation between motivational general imagery values and gender variables (Ağılönü, 2014).

According to the invention method guided by gender variable, the average motivation pre-test scores of 7th grade male students were 12,8000; while the average post-test scores were 17,4250. On the other hand, the average pre-test score of female students was 11,1892 and the average post-test score was 16,7297. Increased general motivation scores of female and male students according to the directed invention method can easily solve more complex skills, develop new tactics, and adopt a multi-faceted way of thinking.

It was found that there was a significant difference between the pre-test and post-test motivation scores of the 7th grade students of physical education courses according to the gender-directed invention method ( $p<0.05$ ). There was a significant difference in the motivation subscale of the 7th grade students according to the gender variable according to the pre-test and post-test mean scores of the physical education course consistent with the directed invention method ( $p<0.05$ ). Motivation was also expressed as the desire to do something; as a reason for the significant difference in terms of gender variable and in terms of both sub-dimensions, it is said that the students' self-confidence increases with the correct answers to the questions and accordingly they are more willing to the subject and the course. It is possible to come across the literature on motivation. Kulinna and Cothran (2003) found that the most commonly used styles of teachers were teacher-centered and the least used styles were learner-centered styles. While teaching centered styles scripts and exercises, learner-centered styles are self-teaching and student-initiated methods. In the country, in the field of physical education, İnce and Hünük (2010) examined the teaching styles used by experienced physical education teachers and their perceptions about these styles by adapting the tool prepared by Kulinna and Cothran (2003) to Turkish and as a result of the research, the most commonly used styles were instructed. This was the least used styles learner-centered (student initiation and self-teaching) (Saraç and Muştu, 2013).

Conclusively, there was a significant difference between the level of imagination and creativity in favor of the post-test according to the directed invention method of 7th grade students. It was found that the level of imagination and creativity of middle school students participating in the experimental study showed a significant difference from before the experiment, being in different process groups and the repeated effects factors had a common effect on imagination and creativity. This finding was found to have different effects on increasing the level of imagination and creativity of 7th grade students who participated in the program according to gender variable. The creativity and imagination scores of male students increased compared to the pre-experiment. Physical education courses, using guided

invention method, contributes to the development of imagination and creativity levels in revealing high level cognitive skills of students. In the directed invention method according to the level of readiness of students, while expressing a new concept or skill, can re-synthesize an existing situation and create a new concept.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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