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Middle School 6th Grade Science Science Course Academic Achievement Of Scamper Technique On Reproduction, Growth And Development In Plants And Animals

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Abstract: *The purpose of this study is to investigate SCAMPER technique on students' academic achievement in the topic of growth and development in plants and animals in 6th grade in science lesson.The research was done in the academic year 2015-2016 with 70 students (6th grade) in Ağrı, Turkey. The control group included 6th grade students who learned the topic with science curriculum, experimental group included 6th grade students who learned the topic both the science curriculum and SCAMPER technique. The approach of pre-test and post- test was used to data collection with growth and development in plants and animals achievement test. 5 semi structured interview questions developed by researcher applied 8 students to recognize student's problem, having difficulties and emotions. The research finding indicate significant difference between post-test scores of control an experimental groups. Moreover, Students in the experimental groups of scores increased shows that SCAMPER technique can increase students' academic success.*

Key Words: *Science education, Creative thinking, Scamper*

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I. Introduction

The educations programs should be renewed by countries to adapt the age which has been enhanced in terms of the science and technology constantly. Societies need an individual not only have knowledge who can think, criticize, construct, create, produce, explore, be active , self-renewing and constantly changing. Therefore education programs should be reconstructed in order to train the individuals the purpose of the features.

The projects conducted by the Ministry of National Education (MoNE) in the context of the times in line with the educational philosophy, students can take an active role and learn by doing and experiencing in the lessons. With the help of these programs, students analysis, synthesize, evaluate that are able to do creative thinking, the development of problem solving skills using knowledge; ıt is aimed to evaluate the performance of students in the evaluation process (MoNE, 2009).

A new program that made by the MoNE (constructivist approach) was implemented in primary schools and students in the course have begun active participation. Students need to make a research in the process of preparing their homework, use the information in their daily life and share this information with their friends. For doing that , teaching methods and techniques should be used to develop students' creativity and study with their peers skills (Mone, 2009).According to Aydoğdu and Kesircioğlu (2005) ,the main purpose of the primary education is that students should be able to understand themselves , their nature and their environment , to reach the knowledge ,produce knowledge, ask a question on problem and also solve this problem.

The existing studies ın Turkey and abroad showed that SCAMPER technique hasn't been done at the secondary level. Especially ın Turkey, when analyzing the researches, it is not done a lot. The reason of the using SCAMPER technique enables students to have a fun, creative thinking and trying to discover.

One of the techniques in the education is creative thinking that enables students to have an original idea about the issues. Although individuals have vary creativity, no one cannot be regarded as devoid of the creativity. For this reason; the most important thing in education is to try to find a way that reveal the creativity and improve it. This is more or less in the all individuals (Majid, Tan and Soh, 2003). Most teachers and educators can think that all students or children are potentially creative. In every person has at least creativity (Cropley, 1997).

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According to Rhodes, creativity is obtained the new product by individual. According to Wilson, Guilford, and Christensen (1953), creativity is unusual and type of an intelligence to make an unique product that go beyond the traditional. Accordingly, teachers and educators can approve that suitable stimulant learning helps the development of the creativity to exist essential features of the creativity. The level of the creativity of the students can change. Creative potential can be enriched with deliberate encouragement, opportunity and education and followed to a young age; the development of creativity can be done during daily training period. In order to increase creativity, continuous efforts must be accompanied (Majid, Tan and Soh, 2003).

The studies examined show that the education of creativity influences the level of the creativity positively; talented students are more than students of all levels (Rose and Lin 1984; Baer 1996;). All people have creative thinking skills. To develop these skills depend on the education. There is no certain way to find out this skill. Individiual requires expertise and patience in own way creative and original interpretations istemektedir (Scott, Leritz and Mumford, 2004).

One way of the improving the creativity in healthy parent and child interaction in a family environment can occur (Godel, 2006). According to Brown and Johnson (2008), the basis of the features of creative children consists from birth family and environment. According to Lamm and Keller, the attitudes and behaviors of parents direct child correctly and guide the level of childs' interest ,ability and development experience in order to grow the improvement of the childs' visual. There are some researchers who call creative economy situated to the information center on (Florida, 2006; Howkins, 2002; Markusen, Wassall, DeNatale and Cohen, 2008).

One of the techniques supported creative thinking is that SCAMPER the type of the brain storming is to encourage creative thinking, practical and funny learning technique. It which includes the progress of thought projects and process on subjects or topics was improved by Robert F. Eberle. In this tecnique ; individual evaluate an object ,then ,making brain storming can be changed it or found a way to foster (Glenn, 1997).SCAMPER technique not only provides a framework for students to use their minds freely but also suggest both systematical and practical approach to think creative and be original (Glenn, 1997).

At the beginning SCAMPER was arisen by Eberle (1971) in order to upgrade students' creativity.

To the technique, one object or person is chosen then it is changed or fostered with brain storming. Public stories well-known can be used .To do this, questions directed to children. The questions encourage students to think in an unfamiliar way. These kinds of questions are like a driving force that allows students to acquire different thinking skills. It encourages them to explore and promote thinking .The technique also teaches how to break patterns of thinking in a flexible way (Yıldızve Israel, 2001). According to Michalko, the main philosophy of this technique is that ''every idea is born from the idea that there's another''.Serrat (2009) said that SCAMPER technique allows students to think differently and enhance problem solving skills and their creativity.

In SCAMPER technique, the tale and story are created with children, new characters are added and removed and roleplaying is done.SCAMPER technique can be used by drama, cooperative learning etc. or self-study in the classroom (Yıldızve Israel, 2001;Gladding, 2011).

Serrat (2009) used SCAMPER technique a set of questions that lead to suggesting that something already existing be added or altered. Moreover; ıt attracts a notice in terms of awareness, fluency, flexibility and originality as a learning tool. It can used to make an original idea. The process of creativity progresses with preparation, concentration, incubation, illumination and verification. An efficient application in organizations depends on the existence of an efficient environment. There are personal barriers to creativity, but these can usually be removed.

According to Ahmet (2016), SCAMPER is a general purpose control list that can think about changes you can make to an existing product or a new product that helps create. It relates to the syntheses using what you know and creating something new as a result in the Bloom's taxonomy. Past research on anxiety and creative thinking related to SCAMPER technique, these methods may be useful in reducing anxiety and increasing flexibility when predicting the figurative (Mijares- Colmenares, Masten and Underwood, 1988).

Science and technology are developing and taking a step day by day. There is a need individual creative-minded to keep pace with these changes and developments in terms of the field of science and technology.In the 21th century, having a successful future, there is a need individuals who are thinking differently, researching, questioning, making out a new and original ideas (Morris, 2006).For this reason, ın the education area must be thought the ways of the knowledge and given a chance how to think creative rather than providing the information.The role of the teacher is to direct ,see the difference ,enable students to make a research and make an original ideas with the constructing the knowledge (Koray, 2003).

Students may be affected by many different situations in the process of the science education such as physical condition of the classroom environment, students' anxiety, their attitude etc. and also the methods and technique which can be used by teachers (Ladd and et all. 1999; Hamre and Pianta 2001; Hughes, Cavell and Wilson, 2001). The purpose of this study is to examine SCAMPER technique how to impact on the students'

success in reproductive growth and development in plants and animals at 6th grade in the science lesson. For the purpose of the research has been identified two sub-purposes.

1- For experimental and control groups students:

a) Examine whether there is a significant difference between academic achievement test they received on the pre-test or not.

b) Examine whether there is a significant difference between academic achievement test they received on the post-test or not.

c) Examine whether there is a significant difference between academic achievement test they received on the pre-test and the post-test in the experimental group or not.

d) Examine whether there is a significant difference between academic achievement test they received on the pre-test and the post-test in the control group or not.

2- To address what the difficulties are , while students in the experimental groups at 6th grade try to understand the reproductive growth and development in plants and animals.

II. Method

Research Model

In this study, students are not distributed randomly into groups quasi-experimental method is used. Semi structured interview is used in order to increase reliability and support the result of the experimental studies for students. Applied in the study of pre and post -test were compared to the quantitative data obtained from the achievement test to examine whether the relationship between them is significant or not. The qualitative data from the research were analyzed by content analysis technique(Karasar, 1999;Çepni, 2007).

Working Group

The research was done in the academic year 2015-2016 in Ağrı, Turkey. The study was conducted on a group of 70 students attending at 6th grade at Murat Kız boarding middle school. Experimental group implemented SCAMPER technique has 35 students included 15 femaleand 20 male. Control group implemented direct instruction technique has 35 students included 18 female and 17 male. The frequency and percentage distributions ofboth male and female students of experimental and control group are given in Table 1.

Table 1: *Frequency and percentage distribution according to gender of the students*

Groups	***Frequency***	***%***
Experimental group-Female students	15	42,85
Experimental group-Male students	20	57,15
Sum	*35*	*100*
Control Group- Female students	18	51,42
Control Group- Male students	17	48,58
Sum	*35*	*100*

Data Collection

The approach of pre-test and post- test was usedto data collection with growth and development in plants and animals achievement test. Recognizing the level of success and whether there is a significant difference between these groups or not, pre-test and post-test were applied to students.

Before the topic of growth and development in plants and animals teached ,pre-test was applied.After applied it in control group, through 4 week (16 hours), this topic teached with both students and teacher active every week of one objective included. In the experimental group students learned this topic with the help of both science curriculum and SCAMPER technique. The final test applied students at the end of this period to investigate the effect of students' achievement. After the implementation, semi-structured interview was implemented 8 volunteer students to get their views about the research (Çepni, 2009). The questions of semi-structured interview were prepared by to support the quantitative date in the experimental study. The topic of growth and development in plants and animals was reserved 3 weeks in academic year of 2015-2016 in the curriculum of science lesson at 6th grade. The research lasted 4 weeks with the implementation of pre and post-tests.

III. Findings

In this section, there are the data of achievement test and semi-structured interview obtained from the form and interpretations.

The first sub-objective finding and interpretations

Achievement test developed was applied to students as a pre and post-test. Before the topic of growth and development in plants and animals is explained, pre-test applied. 4 weeks later, after the topic of growth and

development in plants and animals is explained, post-test applied. Data obtained from these practices were analyzed in the SPSS package program 22.

The experimental and control groups formed to compare the pre-test scores and to search whether there is a significant difference between academic achievement test they received on the pre-test or not in the topic of growth and development in plants and animals in 6th grade. Testing the question, pre-test scores' averages and standard deviation of the experimental and control group were calculated. Independent T test was used in order to determine the difference between groups. The data are shown in Table 2.

Table 2: *The result of pre-test in control and experiematal group*

PRE-TEST	***Mean***	***N***	***SS***	***sd***	***t***	***p***
Experimantal Group	30,0000	35	11,04802	34	-,919	,364
Control Group	33,1429	35	15,34341	34		

The result of the analysis in SPSS, there is no difference between the two groups [t(34)=-,919 ; p>0,05]. Students' pre-test averages in the experimental groups is 30,00, students' pre-test averages in the control groups is 33,14. This shows that students in both groups participated in the research have an equal level of success.

The experimental and control groups formed to compare the last-test scores and to search whether there is a significant difference between academic achievement test they received on the pre-test or not in the topic of growth and development in plants and animals in 6th grade. Testing the question, post-test scores' averages and standard deviation of the experimental and control group were calculated. Independent T test was used in order to determine the difference between groups. The data are shown in Table 3.

Table 3: *The result of post-test in control and experiematal group*

POST- TEST	**Mean**	**N**	**SS**	**sd**	**t**	**p**
Experimantal Group	54,1429	35	12,80428	34	4,238	,000
Control Group	39,2857	35	16,58946	34		

According to last-test scores, students' last-test averages in the experimental groups is 54,14, students' last-test averages in the control groups is 39,28. Standard deviation of the experimental group is 12,80, control group is 16,58 with reference to this data. When we look at the values of the standard deviation, control groups is larger than experimental group. That shows that the data of control group is very far from each other. According to the result of the analysis in SPSS, there is significant difference between the experimental and control groups [t(34)=4,238 ; p<0,05]. This significant difference was in favor of experimental group statistically. When considering the points of difference between pre- and post –test obtained,ıt was observed the experimental group 24, 14%, the control group 6, 14% increased.

The question that is whether there is a significant difference between academic achievement test they received on the pre-test and the post-test in the experimental group or not in 6th grade was examined. Post-test scores' averages and standard deviation of the experimental were calculated and used dependent T test to determine. The numerical data obtained from the experimental group are given in the table 4.

Table 4: *The results of pre- and post-test in experimental group*

Measurement	**N**	**Mean**	**SS**	**Sd**	**t**	**p**
Pre-Test	35	30,0	11,05			
Post-Test	35	54,14	12,80	34	9,765	.000

With respect to the dependent test data, there is no difference between the two test statistically [t(34)=9,76 ; p<0,05]. When you look at the data obtained from students , ıt shows pre-test avarage (30,0) and post-test average (54,14). It was observed that the students in class of pre-test scores increased 24,14 in reference to average percentage. These indicate that students in the experimental group learned the topic of growth and development in plants and animals.

Examining whether there is a significant difference between academic achievement test they received on the pre-test and the post-test in the control group or not the topic of growth and development in plants and animals in 6th grade is researched. The numerical data obtained from the control group are given in the table 5.

Table 5: *The results of pre- and post-test in control group*

Measurement	N	Mean	SS	Sd	t	p
Pre-Test	35	33,14	15,3	34	2,66	,012
Post-Test	35	39,29	16,6			

The control group of pre-test and post-test scores for comparison of dependent test results demonstrate that there is no difference between these tests [t(34)=9,76 ; p<0,05]. Looking at the data obtained from students , ıt shows pre-test avarage (33,14) and post-test average (39,29). It was observed that the students in class of pre-test scores increased 6,15 in reference to average percentage. According to these information students in experimental group could learn this topic.

The second sub-objective finding and interpretations

To support the achievement test and establish the problems of students forgrowth and development in plants and animals and ideas, the interview was made with 8 students in the experimental group. According to interviews, the results of interviews and questions are classified.

Table 6: *To ask student's' ''Did you like the questions/ research ?''If you said yes then why?, ıf you said no ,then why ? Answers*

Question-1	**I liked**	**Easy**	**Our development provided**	**Help to think**	**Help to think creatively**	**Help to leran new things**
Student-1	√	√				
Student-2			√	√	√	
Student-3						√
Student-4				√		√
Student-5				√		√
Student-6						√
Student-7	√				√	√
Student-8	√					

Table 6 examined, to this research ; 3 students gave answer ''I liked.'', 1 student gave ''easy'', 1 student gave ''our development provided'', 3 students gave ''Help to think'', 2 students gave ''help to think creatively'', and 5 students gave ''help to learn new things''. One student explained the experience ''Yes, because I liked the designing the plants in our own heads. We can make some part of the plant better such as different shapes, different color .I have an idea about how I can make the plants in my mind and how I can save the plants.''(Student-7).

Table 7: *The answers of* '' what did you help understand in the course work ?''

QUESTION-2	**ILght on past studies**	**Creating a different perspective**	**Informative**	**Understandingbetter**	**In -depth learn**	**Dreaming**	**Improving mind**
Student-1	√						
Student-2		√					
Student-3			√				
Student-4				√			
Student-5					√		
Student-6			√				
Student-7						√	√
Student-8			√				

Table 7 examined, 1 student answered ''Light on past experience'', 1 student ''creating a different perspective'', 3 students ''informative'', 1 student ''understanding better'', 1 student ''ın-depth learn'', 1 student ''dreaming'' and 1 student ''improving mind''. According to students' answers, informative is the most. One students told that ''This questions help us have informion. For example ; we learned the parts of the flower. In other words, it is informative.'' (student-3).

Table 8: *The answers of 'do you want to learn any topic like this lesson?''*

Question-3	**Sometimes**	**Improve intelligance**	**Receive information**	**Lesson is better**	**Drawing attention**	**Fixing the mistaces**	**Learning from friends**	**Funny**
Student-1	√							
Student-2		√						
Student-3			√	√				
Student-4					√			
Student-5						√	√	
Student-6			√					√
Student-7		√						√
Student-8				√				

Table 8 examined, ''do you want to learn any topic like this lesson? '' asked to students. Then one students answered ''sometimes'' ''ıf all the lesson just like this, I will be bored.''.Other 7 students wanted to this lessons . Asked ''why?'' , the answers were improving intelligance(2 students), Receiving information(2 students), better lesson(2 students), drawing attention(1 student), fixing the mistaces(1 student), learning from friends(1 student), Funny(2 students). One student said ''ı think it is good to fix the mistakes and receive information .For exmaple; you don't know , your friends can explain better. Moroever, ıf we do this type of exams , we can learn while doing the exam.''(student-5).

Table 9: *The answers of "What has it done for you ?''*

Question-4	**Improving intelligence**	**Improving the vocabulary**	**Permanent learning**	**Have a different perspective**	**Improving our development**
Student-1				√	√
Student-2	√	√			
Student-3			√		
Student-4			√		√
Student-5					√
Student-6			√		
Student-7			√		
Student-8			√		

Table 9 examined, students answers were improving intelligence, improving the vocabulary, permanent learning, having a different perspective and improving our development. One students explained ''for example, we can learn the parts of the flower. We can learn permanently. For instance, we learned when we see the plants how to give water.''(Student-7).

Table 10: *The answers of ''what were the points you get stuck in work that we have done?''*

Question-5	**Student 1**	**Student 2**	**Student 3**	**Student 4**	**Student 5**	**Student 6**	**Student 7**	**Student 8**
Yes	√	√				√		
No			√	√	√		√	√

Table 10 examined, when the question asked, 5 students gave ‘’none’’, other 3 students gave ‘’some questions’’ answers. One child explained the reason of this ‘’If you design the plant, how would you design the plant? is confusing me .I think everything is in the harmony and equilibrium , we have no right to disrupt this harmony and equilibrium.’’(Student-1).

IV. Dissusion And Result

The purpose of this study made to research SCAMPER technique on the topic of growth and development in plants and animals in 6th grade. According to findings , discussion and results are in the below.

Discussion and conclusion regarding to first problem

The result of the pre-test scores both experimental and control group showed in table 2. According to pre-test results, there is no difference between experimental and control groups. Based on this, ıt can be said that the students participated in study have an equal level of success. As a result of research indicates SCAMPER technique is reliable to show whether it has any influence on student’s success or not.

The result of the post-test scores both experimental and control group showed in table 3.The results shows that there is significant difference between them. This difference result in experimental’ group favor. It can be said that SCAMPER technique is positive attitude on the success of the students in experimental group. Other studies also support these findings on this subject. Dzeyziewicz, GajdaveKarwowski (2014), DursunveÜnivar (2011), Erkan (2005), GaraigordobilveBerrueco (2011), Can-Yaşar (2009), Chronopoulouve Riga (2012), Mirzadieve ark. (2009), Şahintürk (2012), Yeh ve ark. (2006), Zachopoulouve ark. (2006), specified that ıf students are subjected to the education program supported by creative thinking – this studies shows there issignificant difference between both groups-, creative thinking of students can be improved. According to research results, SCAMPER of the training program has been determined to be effective in determining characteristic and behaviors of creativity. Accordingly, the children in improving their scores in the experimental group that aims to focus on educational activities to encourage the active participation and creativity are effective training program (KaytezveGüngörAytar 2016).

The data of the pre-test and post –test are shown in table 4. Numerical data obtained were analyzed in the SPSS 22 program. According to the result of this analysis, students in the experimental group pre and post test scores found a significance difference between and also the mean increased by 24,14% .These show that the topic of growth and development in plants and animals is learned by science curriculum and SCAMPER technique.

While GaraigordobilveBerrueco (2011) were searching the game-based learning on students’ creativity and behavior, they found difference between the control and experimental group’s averages. According to this result, students in the experimental group (game based learning) influenced students creativity and behaviors positively. Also pre-school education programs, especially games integrated with creative game-based learning is highly effective in children. According to Toraman and Altun (2013), students learned the habitat of animals and improved the concept of issue ; ıt can be suggested that SCAMPER technique is to offer the opportunity to move beyond the mental patterns students , to motivate enhancing the cognitive development of students, changing ideas of students on issues or compounding the ideas and thinking creatively.In addition, the diversity of living organisms in terms of characteristic of ecosystems and climate in the research that showed improvement was observed.Serrat (2009) pointed out SCAMPER technique enabled person to quarry a situation, produce a solution, give chance studying individually and with groups came to exist.

The data of the pre-test of control group are shown in the table 5. . Numerical data obtained were analyzed in the SPSS 22 program. According to the result of this analysis, students in the control group pre and post test scores found a significance difference between and also the mean increased by 6,15%.It can be said students can learn the topic science curriculum. This result is same as the finding Al-Jallad (2006); when compared the control and experimental grop, control group ,there is significant difference between groups in terms of fluency, flexibility and originality to develop creative thinking.

Discussion and conclusion regarding to second problem

Determining the student’s problems, finding solution their problems and what the difficulties are applied semi structured interview, while teaching the topic of reproductive growth and development in plants and animals. In order to identify these situations, students are asked 5 questions. Semi-structured interviews are described in more detail due to the fact that students questions that cannot be understood. Their answers were analyzed and students are grouped in tables.

The first question of semi-structered interview - *’Did you like the questions/ research ?’’- analyzed that all students gave ‘’yes’’ answer in terms of* ‘’I liked.’’, ‘’easy’’, ‘’our development provided’’, ‘’Help to think’’, ’help to think creatively’’, ‘’help to learn new things’’. The majority of students answers for first question ‘’ that allows us to gather knowledge’’ stand out. When analyzing the studies, students are confortable to express their

thoughts and feelings and act creative behavior (Garaigordobil and Berrueco 2011; Kaufman and Baer 2005).On the other hand, ıt enable students to support creativity & development and get significant contribution (Eberle, 1977).

All students answered it helped us understand what's going on to the second question of semi – structured interview –'' what did you help understand in the course work ?''- .The students answers were 'Light on past experience'', ''creating a different perspective'', ''informative'', ''understanding better'', ''ın-depth learn'', ''dreaming'' and ''improving mind''.A the first question, the most answer was gathering knowledge. This result supported to Torun and Altun(2013) ; If the SCAMPER technique can be applied actively, ıt can be useful students to think creativily, motivate, give a chance to improve the cognitive development. The study of Çeğinidr and Öz (2016) support this study in terms of the permanent learning. The parent's attitude is positive to consciences of Atatürk in the 2nd grade students (Yağcı, 2012). The activities in education program is perceived by children as a game , in this case children can join the activities willingly (Yıldız and Israel, 2001). While Lee (2005) was examining the relationship between creative thinking and creative personality, there was a significant relationship between them and proposed to support creative thinking and creative personality.Acording to Yıldız(2011) , the questions include in SCAMPER technique helps children think creatively and personality . In accordance with the results obtained from the research , the following recommendations can be made below.

One of the student answered ıf the lesson sometimes is made, ıt can be better, If not ,student will be bored to the third question of semi-structered interview-''do you want to learn any topic like this lesson? ''- Other students answers were improving intelligence, receiving information, better lesson, drawing attention, fixing the mistakes, learning from friends and funny. Just like first and second questions , students gave answer to third question was informative. It is understood that students study knowledge oriented in reference to these three question in the interview.

The answers' of the question fourth -''what has it done for you?''- were improving intelligence, improving the vocabulary, permanent learning, having a different perspective and improving our development. The majority of students answer was permanent learning.Students low success and low attendance participated in these activity actively , took interest in lesson especilally in the acrostic, line drawing ,painting and creative events. The studies of Thomas (2000), Coşkun (2004), Aladağ (2005), Çıbık (2006), Yılmaz (2006), Görecek (2007), Uzun (2007) and Feyzioğlu and etc. (2012) supported this study.

The last question of interview ''what were the points you get stuck in work that we have done?'' answered none. This showed in table 10. The studies of Yağcı (2012), Ceran and etc. (2015) and Karataş (2016) showed that SCAMPER technique improve students' academic achievement and solving problem creatively skills .

V. Suggestions

İnvestigating SCAMPER technique for students' academic achievement, achievement test and semi-structured interview were done. According to results of them, various results were obtained. In the line with these results, the suggestions can be listed below;

- SCAMPER technique can be used to increase students' success and persistence in science lesson.
- This study applied in 6th grade. This study can be applied in primary, secondary, high school and university students.
- This technique can be applied other topics.
- SCAMPER technique can be used in other lesson ,ıf it can be done, interdisciplinary relationships can be investigated.

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