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The Effect of the Differentiation Approach on the Achievement of Gifted Students[1]

Farklılaştırma Yaklaşımının Üstün Zekalı Öğrencilerin Başarılarına Etkisi

Esra Altıntaş
Department of Elementary Mathematics Education, Marmara University, İstanbul, hoca_kafkas@hotmail.com

Ahmet Ş. Özdemir
Department of Elementary Mathematics Education, Marmara University, İstanbul, aso23@hıotmail.com

Abstract:
The purpose of the study is to develop a differentiation approach for the mathematics education of gifted students and to analyze the effect of this approach on the success of these students. The answers of the following sub-problem was also searched: Is there any significant difference between achievement test scores and general, current and enriched attainment scores of control and/or experimental group gifted students before and after the study? In this study, pre-test and post-test with control group model was used for analyzing the effect of differentiation approach on the achievement of gifted students. The sample of this study consisted of 27 5th grade gifted students from a private school in Maltepe, Istanbul. Two different mathematics achievement tests related to the subject of "Tables and Graphics" and Multiple intelligence test were used. According to the findings, it was observed that the differentiation approach is effective on improving the achievement of students.

Keywords: Mathematics education, giftedness, differentiation approach, multiple intelligence, creativity.

INTRODUCTION

We need educational models and approaches which will improve the existing potential of gifted students in mathematics and will change their perspectives towards mathematics, which will open the doors of the enjoyable world of the mathematics and which will help them to develop positive attitudes towards mathematics in this way. Since students are labelled as gifted, it is thought that they can handle with everything without any additional support. In fact, it is necessary to use one's best endeavour for the education of gifted students as the education of mentally disabled students. For this, it is necessary to support gifted children in terms of improving their existing potential to top level and to take necessary precautions for the education of gifted children. This support is a necessity for mathematics education.

'Individual differences and the diversity of individuals create a basic obstacle for teaching in each school. However, ignoring individual differences is also the basic mistake of the education system.' it is asserted with this expression that educational systems and each person are different individuals in terms of individual characteristics, intelligences and behaviours and it is not true to teach these individuals with uniform patterns (Taller, 2004).

Providing additional education opportunities which will meet the special needs of gifted students, will help them to improve their own existing potentials and will provide them to use their own learning capacities in high levels is seen as a highly valid and successful method (Tüzünak, 2002). While gifted students are being taught with their peers, being aware of their individual abilities and developing educational methods which will meet their special learning needs and enable them to use their own capacities by improving them and offering extra opportunities is accepted as a more healthy approach (Tunçdemir, 2004).

Gifted children have high level thinking capacities. It is known that gifted students can establish extra-ordinary connections between various thinking systems, events, cases or information and they enjoy doing this in real life situations. Most of the gifted students have deep interest and curiosity towards scientific contradictions and problems which are specific to disciplines. Most of them desire to make creative contributions and to help problem solving in the fields which they are talented. Gifted students are more fast-paced than other students in learning activities such as problem solving and understanding new information and that is why they need less time for learning. Most of the gifted students prefer to behave independently, to be in decision making mechanisms and to create learning routes in accordance with their own interests (Sak, 2009).

There are positive findings regarding that creativity can be improved with suitable materials and methods in proper and suitable learning environments (Orhon, 2011). In this sense, it is necessary to give great importance

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to improve creative thinking skills of gifted students especially and to integrate thinking skills with the lessons rather than giving a theoretical creative thinking education.

VanTassel-Baska and Worley (2006) state the necessity of developing more complicated curriculums which are based on experiences, discoveries and which handle the basic needs of students more deeply. They find important to increase the amount of experiences and to diversify these experiences gained in classroom environment (Karasu, 2010).

It is argued that gifted students need a differentiated curriculum which satisfies their own skills and potentials (Schack, 2011 cited in Clark, 1992; Gallagher, 1985; VanTassel-Baska, 1988). These approaches mostly include the changes in content, process, product and learning environment (Schack, 2011 cited in Maker, 1982a). The changes in the curriculums include learning skills such as creativity, critical thinking and problem solving (Schack, 2011 cited in Davis &Rimm, 1989). Renzulli and his friends claim that giftedness can be seen while students are responding rather than the stimulus and the teachers need to suggest an intriguing curriculum for all students to help them to improve their gifted behaviours (Schack, 2011 cited in Renzulli, 1977; Renzulli &Reis, 1985; Renzulli, Reis & Smith, 1981).

Because the differentiation approach developed by the researchers depend on creative thinking skills, multiple intelligence approach, multidisciplinary approach and project-based learning, at the end of the literature scanning made there were achieved to the following results.

The teaching applications based on creative thinking skill increase the achievement of students (Scott, Leritz &Mumford, 2004; Akçam, 2007; Demirci, 2007; Kadayıfçı, 2008; Özcan, 2009; Özerbaş, 2011; Kök, 2012; Kurtuluş, 2012) and making differentiation with a teaching model in addition to the creativity increase the achievement of students (Kök, 2012).The applications based on project based learning increase the achievement of students (Gözüm, Bağcı, Sünbül, Yağız & Afyon, 2005; Özdemir, 2006; Çırak, 2006; Çiftçi, 2006; Yılmaz, 2006; Yurttepe, 2007; Cengizhan, 2007; Atik, 2009; Yıldız, 2009; Özer & Özkan, 2010; Doğay, 2010; Baş, 2011; Dağ & Durdu, 2011; Poonpon, 2011; Değirmenci, 2011; Keskin, 2011; Yıldırım, 2011; Karaçallı, 2011; Deniş Çeliker, 2012; Kaşarcı, 2013; URL-1).

Using multiple intelligence approach in project based learning and cooperative learning increase the achievement of students (İflazoğlu, 2003; Yıldırım, 2006; Işık, 2007; Kayıran, 2007; Koç, 2008; Yıldırım & Tarım, 2008; Tabuk, 2009; Kayıran, 2009; Baş & Beyhan, 2010). Grouping students according to their talents or homogeneus grouping are positive effect on the achievement of gifted students (Kulik & Kulik, 1982; Rogers, 1991; Hoffer, 1992; Adodo & Agbayewa, 2011).

It was determined that multiple intelligence based teaching increases the achievement of students (Başbay, 2005; Özyılmaz Akamca & Hamurcu, 2005; Günay Balım, 2006; Kılıç Demirkaya, 2006; Karadeniz, 2006; Temur, 2007; Karakoç & Sezer, 2007; Hamurlu, 2007; Yıldırım & Tarım, 2008; Öngören & Şahin, 2008; Uzunöz, 2008; Altun, 2009; Sivrikaya, 2009; Şirin, 2010; Elmacı, 2010; Gözüm, 2011; Altınsoy, 2011; Uzunöz & Akbaş, 2011; Yalmancı & Gözüm, 2013).

Also enrichment activities (Lam-Kan, 1985; Cheong & Swee, 1987; McSheffrey & Hoge, 1992; Andersen-McShea, 1997; Olszewski-Kubilius & Lee, 2004; Kirkey, 2005; Coyne & Fogarty, 2007; Beecher & Sweeny, 2008; Luehmann, 2009; Fakolade & Adeniyi, 2010; Al-Zoub, 2011; Singh, 2013) and curriculum differentiation(Hallinan & Kubitschek, 1999; Kirkey, 2005; Mastropieri & others, 2006; Beecher & Sweeny, 2008; Olah, 2008; Colson, 2008; Simpkins, Mastropieri & Scruggs, 2009; Kadum-Bošnjak & Buršic-Križanac, 2010; Reis, McCoach, Little, Muller & Kaniskan, 2011; Gorman, 2011) increase the achievent of students.

By moving from these explanations the problem sentence of the study can be stated as: 'Is there any effect of differentiation approach which is developed for middle school level gifted students' mathematics education on the success of gifted students? The purpose of this study is to research the effect of a differentiation approach developed by the researchers for the mathematics education of middle school level gifted students on the success of gifted students.

In accordance with the purpose of the study carried out for the middle school level gifted students, the answers of the following sub-problem was also searched: Is there any significant difference between achievement test scores and general, current and enriched attainment scores of control and/or experimental group gifted students before and after the study?

A differentiation approach which can be used in accordance with the conditions of Turkey and which will improve the existing potentials of gifted students in mathematics education in our country was designed and acted for satisfying the needs on this point. In this sense, this study is important in terms of designing a differentiation approach for gifted students to improve their achievement levels and to help them to use their existing potentials effectively in mathematics lessons. For this reason, we planned to design a differentiation approach which can be used as an example in the future by teachers who are teaching gifted students and activities which are based on this approach. Differentiation approach is important in terms of strategies for developing especially creative thinking skills and including activities for these strategies. Besides, the effect of project based and creativity based approach on gifted students' mathematical achievements will also be examined.

METHODOLOGY

The Research Model:

In the present study pre test–post test with control group model was used in appropriate with quantitative research method. There are two groups brought about randomly in this model. There are pre test post test measurements in both groups (Karasar, 2005). In the present study experimental group consists of 13 gifted students, control group consists of 14 gifted students.

Population and Sample:

The population of this study consisted of 5th grade gifted students from middle schools in Maltepe region of Istanbul. The sample of this study consisted of 27 5th grade gifted students from a private school in Maltepe, Istanbul.

Groups were formed by combining students who were dominant at the same intelligence area by considering each student's dominant intelligence (whose total score in intelligence area was between 32 points - 40 points).

Data Collection

Data Collection Instruments

In order to determine the effect of differentiation model which was developed for the mathematics education of gifted students within the scope of this study on the mathematical achievement of gifted students, questions which were used in the nationwide exams in recent years about the subject, questions which were produced by the researcher and which were taken from various test books were considered. Multiple intelligence test which was prepared by Saban (2005) was used. The intelligence of which point between 32 and 40 was accepted as dominant.

Two different mathematics achievement tests, one for pre-test and one for post-test were used regarding the 5th grade subject 'Tables and Graphics'. The item analysis values of draft achievement test (pre-test) were calculated (total items-remaining items- item discrimination) and cronbach alpha value was found as 0.776 before eliminating questions and as 0.815 (21 questions) after eliminating questions. Cronbach alpha value was found as 0.789 before eliminating questions and as 0.780 (21 questions) after eliminating questions by making same calculations for post-test.

Differentiation Approach

In terms of developing a curriculum differentiation model, some changes were made in content, process, product and learning environment of a subject which was chosen from National Education mathematics curriculum. While doing this, content, process and product dimensions were explained by the researchers as in the following.

Content = Enriched objective + Theme (subject, content)
Process = Determining the multiple intelligence areas of the students + Strategies which will be used by the teacher + Basic skills + Research skills + Productive skills
Product = Products

Learning environment = A learning environment which was totally in accordance with the skills and interests of gifted students and which was based on discovery, research and innovation where students would learn and have fun, could relate mathematics with interdisciplinary subjects, could enrich their understanding about subjects with high level attainments, at the same time they could have opportunities to improve their creativity and where they were responsible from each other's learning was designed.

Since enriched attainments were important in terms of determining the content of the subject, they were discussed together with content dimension. As the determination of multiple intelligence areas of the students would affect teachers' strategies and students' projects phase, it was discussed in process dimension. In addition to the lesson plan stated in Kaplan's model, 'The Determination of multiple intelligence areas of students,' 'enriched attainments' and 'teacher's strategies' columns were added to the table.

The multiple intelligence areas of students were determined by using 'Multiple Intelligence Areas for Students Inventory'. Besides, the data obtained as a result of determining students' multiple intelligence areas were also used while determining the project subjects of students, deciding on the teaching strategies that would be used by the teacher and determining the points that should be considered while motivating students (in giving examples about the subject, asking students to write problem sentences and selecting the problems about the subject). During the enrichment of the attainments phase, the attainments were enriched by adding attainments regarding the subjects which would be covered in the next grade. While using strategies, strategies stated in the second dimension of the Williams' model were considered.

While designing differentiation model, the models of Williams, Maker, Kaplan, Autonomous Learner and Maker Matrix were utilized. Among 5 problem types stated within the scope of Maker matrix model, Type III and Type V were especially emphasized. Type III problems were constructed as having a series of answers and permitting a series of methods for reaching a solution. Type V problems were constructed well. For this type of problems, students need to define the problem, find a solution method and establish a criterion for finding the solution (VanTassel-Baska and Brown, 2009 cited in Marker et al., 1994).

Within the scope of the model design, it was examined that the strategies in Williams' model corresponded to which process changes in Maker model. The purpose here was to determine process changes that would be used in curriculum through the strategies that would be used according to subjects. The strategies in Williams' model which corresponded to process changes in Maker model were created according to the explanation of each strategy. Consequently, the cases which are necessary for the process changes will be carried out by using appropriate strategies. By doing this way, it is seen that process changes and strategies are corresponding to each other. Besides, it will be ensured that strategies will be used as to provide product changes in Maker. With the help of strategies students will already produce a number of products. Their teachers, peers and even interdisciplinary teachers (Real audiences) will listen to these products. Students who presented their subjects will go through peer and teacher evaluation.

During the process phase of the designed model, at the point which requires research skills, that is, especially when students need to prepare projects, students are particularly asked to use 'The Information Process' among the skills which are included in the scope of research skills in the process phase of Kaplan model. In short, they are asked to develop a project report which will answer all the questions in each phase of the 'information process' (Definition, Determination, selection ...) in their studies.

In addition to that, an assessment form which was prepared according to the Information Process will be used for evaluating the projects of the students. Students will be informed about the effect of each stage on the assessment of projects.

For the enrichment of the attainments, attainments related to the themes which will be taught in next grade were added to attainments which were related to the themes and classroom of this study. If the subjects of this study did not continue in the next grade, then the teaching would be carried out with the teaching activity which was designed by considering the approach developed by the researcher for the attainments of this theme. Later on, students are asked to do individual and detailed project studies about the theme. In detailed project studies, students are asked to behave individually and to consider the whole issue while doing projects. In project studies, students are asked to study individually and to create interdisciplinary projects by considering the whole issue. At this stage, students also choose a different subject teacher as project guide for themselves in addition to the teacher of the course and they are asked to prepare a project according to their interests.

FINDINGS

Before the study, for the achievement test scores of the gifted students in groups C and D, since the number of students in both groups was less than 30 (13 Students in Group C - 14 students in Group D) Mann-Whitney U test which is the non-parametric alternative of the independent group t-test was used and the findings were interpreted.

In Table 1, the results of Mann Whitney U Test used for assessing whether there was difference between achievement test scores (Pre-General) of gifted students in Group C and Group D before the study, were given.

Table 1.
The mann whitney - u test comparison regarding achievement test scores (pre-general) of gifted students in group c and group d before the study.

Group	N	Rank Average	Rank Sum	U	p
C	13	12.31	218.00	69.000	0.281
D	14	15.57	160.00		

According to Table 1, there is not a significant difference between achievement test scores of gifted students in Group C and Group D before the study (U= 69.000, p=0.281>0.05). However, since the rank average of Group D was bigger than Group C, Group C was selected as experimental group and Group D as control group.

In Table 2, the results of Mann Whitney U Test used for assessing whether there was difference between general achievement test scores and enriched attainment scores of gifted students in control and experimental groups before and after the study, were given.

Table 2.
The mann whitney - u test comparison regarding achievement test scores (general-current-enriched attainment) of gifted students in control and experimental groups before and after the study.

Score	Group	N	Rank Average	Rank Sum	U	p
Pre-General	Control	14	15.57	160.00	69.000	0.281
	Experimental	13	12.31	218.00		
Post-General	Control	14	7.89	110.50	5.500	0.000
	Experimental	13	20.58	267.50		
Pre-Current	Control	14	19.43	272.00	15.000	0.000
	Experimental	13	8.15	106.00		
Post-Current	Control	14	7.50	105.00	0.000	0.000
	Experimental	13	21.00	273.00		
Pre-Enriched	Control	14	15.07	211.00	76.000	0.458
	Experimental	13	12.85	167.00		
Post-Enriched	Control	14	10.25	143.50	38.500	0.010
	Experimental	13	18.04	234.50		

According to Table 2, there is not a significant difference between general (U=69.000, p=0.281>0.05) and enriched (U=76.000, p=0.458>0.005) attainment scores of gifted students in control and experimental groups before the study. There is a significant difference between current scores (U=15.000, p=0.000<0.05) of groups before the study. The rank average of control group students regarding current score is higher than experimental group students. However, there is a significant difference between general (U=5.500, p=0.000<0.05), current (U=0.000, p=0.000<0.05) and enriched (U=38.500, p=0.010<0.05) attainment scores after the study. The rank average of experimental group students regarding general, current and enriched attainment test scores is higher than control group students. In this case, there was an increase in the achievement test general, current and enriched attainment scores of experimental group students after the study. The rank average of experimental group students regarding general, current and enriched attainment test scores is higher than control group students. In this case,

there was an increase in the achievement test general, current and enriched attainment scores of experimental group students after the study. When the results inferred from Table 2 are considered it is seen that there is an increase in experimental group students' general, current and enriched attainment scores after the study unlike control group students. This proves the effectiveness of the differentiation approach developed by the researcher.

In Table 3, the results of Wilcoxon Signed Ranks Test used for assessing whether there was difference between general, current and enriched attainment scores of gifted students in control group and general, current enriched attainment scores of gifted students in experimental groups before and after the study, were given.

Table 3.
The wilcoxon signed ranks test comparison regarding general, current and enriched attainment scores of gifted students in control and experimental groups before and after the study.

Group	Score	Post-Test-Pre-Test	N	Rank Average	Rank Sum	z	p
Control	Pre-General-Post-General	Negative Rank	14	7.50	105.00	-3.311	0.001
		Positive Rank	0	0.00	0.00		
		Equal	0				
	Pre-Current-Post-Current	Negative Rank	12	6.50	78.00	-3.084	0.002
		Positive Rank	0	0.00	0.00		
		Equal	2				
	Pre-Enriched Post-Enriched	Negative Rank	11	6.23	68.50	-2.334	0.020
		Positive Rank	1	9.50	9.50		
		Equal	2				
Experimental	Pre-General-Post-General	Negative Rank	1	1.00	1.00	-2.983	0.003
		Positive Rank	11	7.00	77.00		
		Equal	1				
	Pre-Current-Post-Current	Negative Rank	0	0.00	0.00	-3.189	0.001
		Positive Rank	13	7.00	91.00		
		Equal	0				
	Pre-Enriched Post-Enriched	Negative Rank	3	5.33	16.00	-2.085	0.037
		Positive Rank	10	7.50	75.00		
		Equal	0				

According to Table 3, there is a significant difference between general ($z=-3.331$, $p=0.001<0.005$), current ($z=-3.084$, $p=0.002<0.005$) and enriched ($z=-2.334$, $p=0.020<0.005$) attainment scores of gifted students in control group before and after the study. When the rank average and rank sum of the difference scores are considered, it is seen that the difference observed is in favour of negative ranks, which is pre-pest. There is a significant difference between general ($z= -2.983$, $p=0.003<0.05$), current ($z= -3.189$, $p=0.001<0.05$) and enriched ($z= -2.085$, $p=0.037<0.05$) attainment scores of gifted students in experimental group before and after the study. When the rank average and rank sum of the difference scores are considered, it is seen that the difference observed is in favour of positive ranks, which is post-test. According to these results, it can be said that the differentiation approach is effective on improving the success of students.

Conclusions and Suggestions

This study in which pre test-post test with control group model was used aiming at determining the effect of the differentiation approach on students has been made with 68 gifted students and 144 non-gifted students who are in 5th, 6th and 7th grade and 5 teachers of mathematics in the autumn academic term of 2012-2013 applying to different grades and using different subjects in two state school and one private school. But the research which was applied to the 5 th grade gifted students (27 gifted students) is included in the present study. For gathering data multiple intelligence test and 2 different achievement tests developed by the researchers (one for pre test and the other for post test) were used.

It was concluded from the data that there wasn't any significant difference between enrichment attaintment and general scores of the students in control and experimental group in pre test. There was a significant

difference between present attaintment scores of control and experimental group in favour of control group. But after the application there was a significant difference between present attaintment, enrichment attaintment and general scores in favour of experimental group. When there was a decrease in present attaintment, enrichment attaintment and general scores of control group before and after the application, there was an increase in present attaintment, enrichment attaintment and general scores of experimental group before and after the application. There wasn't any significant difference between the achievement of gifted students in control and experimental group before the application. But after the application there was a significant difference between the achievement of gifted students in favour of experimental group.

When compared with the control group, there was a significant increase in the achievement of the gifted students in experimental group to whom was applied the activities based on the differentiated approach developed in scope of the present study.

These results show that the activities which are enriched, creativity based, project based, multiple intelligence based and curriculum differentiation researches increase the academic achievement of students. Also, content, process, product and learning environment changes based on creativity strategies increase the achievement of students. As a result of the applications, the study is coincided with Scott, Leritz & Mumford (2004), Akçam (2007), Demirci (2007), Kadayıfçı (2008), Özcan (2009), Özerbaş (2011), Kök (2012), Kurtuluş (2012) because of basing on creative thinking skill, is coincided with Kök (2012) because of making differentiation with a teaching model in addition to creativity, is coincided with Gözüm, Bağcı, Sünbül, Yağız & Afyon (2005), Özdemir (2006), Çırak (2006), Çiftçi (2006), Yılmaz (2006), Yurttepe (2007), Cengizhan (2007), Atik (2009), Yıldız (2009), Özer & Özkan (2010), Doğay (2010), Baş (2011), Dağ & Durdu (2011), Poonpon (2011), Değirmenci (2011), Keskin (2011), Yıldırım (2011), Karaçallı (2011), Deniş Çeliker (2012), Kaşarcı (2013), URL-1 because of including project based learning, is coincided with İflazoğlu (2003), Yıldırım (2006), Işık (2007), Kayıran (2007), Koç (2008), Yıldırım & Tarım (2008), Tabuk (2009), Kayıran (2009), Baş & Beyhan (2010) because of including multiple intelligences in project based learning and collaborative leraning, is coincided with Kulik & Kulik (1982), Rogers (1991), Hoffer (1992), Adodo & Agbayewa (2011) because of making talent grouping or homogeneous grouping, is coincided with Başbay (2005), Özyılmaz Akamca & Hamurcu (2005), Günay Balım (2006), Kılıç Demirkaya (2006), Karadeniz (2006), Temur (2007), Karakoç & Sezer (2007), Hamurlu (2007), Yıldırım & Tarım (2008), Öngören & Şahin (2008), Uzunöz (2008), Altun (2009), Sivrikaya (2009), Şirin (2010), Elmacı (2010), Gözüm (2011), Altınsoy (2011), Uzunöz & Akbaş (2011), Yalmancı & Gözüm (2013) because of containing multiple intelligence, is coincided with Lam-Kan (1985), Cheong & Swee (1987), McSheffrey & Hoge (1992), Andersen-McShea (1997), Olszewski-Kubilius & Lee (2004), Kirkey (2005), Coyne & Fogarty (2007), Beecher & Sweeny (2008), Luehmann (2009), Fakolade & Adeniyi (2010), Al-Zoub (2011), Singh (2013) because of containing enriched activities, is coincided with Hallinan & Kubitschek (1999), Kirkey (2005), Mastropieri ve others (2006), Beecher & Sweeny (2008), Olah (2008), Colson (2008), Simpkins, Mastropieri & Scruggs (2009), Kadum-Bošnjak & Buršic-Križanac (2010), Reis, McCoach, Little, Muller & Kaniskan (2011), Gorman (2011) because of making curriculum differentiation.

In accordance with these results, other recommendations can be given to as follows:

It is recommended that the applications of the differentiated approach developed should be made in different lessons.

It is recommended that the teaching made based on the activities designed according to the differentiated approach developed should be looked at the effects on the mathematics attitude, mathematical problem solving attitude, permanence and critical thinking skills.

The project topics designed based on the differentiated approach developed should be redesigned by taking into consideration with different process changes and different creativity strategies.

It is recommended that a different branch teacher or someone whom students prefer and feel themselves in comfort together with researcher, teacher and their peers should watch and evaluate the presentations of the students.

It is recommended that the videotape records should be watched by the students at home and they should made self evaluation.

It is recommended that teachers and students should use the differentiation approach developed in some periods for getting experience.

It is recommended that the applications according to the differentiation approach developed should be made and some data should be gathered by determining pilot schools in nationwide.

It is recommended that teachers should be informed about how they will guide to the project preparation process and students should be informed about hw they will prepare projects in nationwide.

It is recommended that there should be seminars to the teachers and teacher candidates aiming at teaching differentiated approach developed in present study, different approaches and models and applications of approaches and models which are efficient on gifted students.

There should be some approaches and models by taking into consideration with Turkey's present education system aiming at giving support to the education of gifted students.

REFERENCES

Adodo, S. O. & Agbayewa, C. O. (2011). Effect of homogenous and heterogeneous ability grouping class teaching on student's interest, attitude and achievement in integrated science. *International Journal of Psychology and Counselling*. 3(3), 48-54.

Akçam, M. (2007). *İlköğretim fen bilgisi derslerinde yaratıcı etkinliklerin öğrencilerin tutum ve başarılarına etkisi*. Unpublished master thesis. Balıkesir: Balıkesir University, Institute of Science.

Altınsoy, A. B. (2011). *Fen ve teknoloji dersinde çoklu zeka kuramına dayalı öğretimin öğrencilerin başarılarına etkisi*. Unpublished master thesis. Konya: Selçuk University, Institute of Educational Sciences.

Altun, Ç. (2009*). Fen bilgisi öğretiminde "maddenin yapısı ve özellikleri" ünitesinin kavranmasında çoklu zeka kuramına dayalı öğretimin öğrenci başarısına etkisi*. Unpublished master thesis. Kars: Kafkas University, Institute of Science.

Al-Zoub, S. M. (2011). The effect of enrichment activities on talented students' achievement. *Modern journal of education.* Vol.1. No:2/3.

Andersen-McShea, B. (1997). The effects of a summer mathematics enrichment program on hispanic mathematical achievement. ProQuest.

Atik, C. (2009). *İlköğretim fen ve teknoloji öğretiminde proje tabanlı öğrenme yaklaşımının öğrencilerin akademik başarıları üzerine etkisi.* Unpublished master thesis. Isparta: Süleyman Demirel University, Institute of Science.

Baş, G. ve Beyhan, Ö. (2010). Effects of multiple intelligences supported project-based learning on students' achievement levels and attitudes towards english lesson. *International Electronic Journal of Elementary Education*. 2(3), 365-385.

Baş, G. (2011). Investıgatıng the effects of project-based learnıng on students' academıc achıevement and attıtudes towards englısh lesson. *TOJNED: The Online Journal Of New Horizons in Education*.1(4), 1-15.

Başbay, A. (2005). Çoklu zekâ uygulamasına katılan öğretmenlerin ve öğrencilerin uygulama hakkındaki görüşleri üzerine nitel bir araştırma. *Abant İzzet Baysal University Educational Faculty Journal*. 5(2), 189-206.

Beecher, M. & Sweeny, S. M. (2008). Closing the achievement gap with curriculum enrichment and differentiation:one school's story. *Journal of Advanced Academics*. 19(3), 502-530.

Cengizhan, S. (2007). Proje temelli ve bilgisayar destekli öğretim tasarımlarının; bağımlı, bağımsız ve iş birlikli öğrenme stillerine sahip öğrencilerin akademik başarılarına ve öğrenme kalıcılığına etkisi. *Turkish Educational Sciences Journal*. 5(3), 377-401.

Cheong, A. C. S. & Swee, L. K. K. (1987). The contributions of enrichment activities towards science achievement. *Sıngapore Journal Of Educatıon.* 8(1), 63-75.

Colson, K. (2008). Why Differentiating the curriculum for high achieving first grade students is so important. Unpublished Research Report. Colloquium on Research for Educators, Azusa. Web:http://education.apu.edu/dept/as/educ589/files/papers/EDITED%20K.%20Colson%20EDUC%20589%20Final%20Report.doc (accessed october 2013)

Coyne, M., & Fogarty, E. (2007). Using the schoolwide enrichment model reading framework (sem-r) to increase achievement, fluency, and enjoyment in reading. Web:http://www.tne.uconn.edu/Research/TNE%20Grant%20_SEM-R.pdf (accessed september 2013)

Çırak, D. (2006). *The use of project based learnıng in teaching english to young learners.* Unpublished master thesis. Konya:Selçuk University, Institute of Social Sciences.

Çiftçi, S. (2006). *Sosyal bilgiler öğretiminde proje tabanlı öğrenmenin öğrencilerin akademik risk alma düzeylerine, problem çözme becerilerine, erişilerine kalıcılığa ve tutumlarına etkisi.* Unpublished doctoral dissertation. Konya:Selçuk University, Institute of Social Sciences.

Dağ, F. ve Durdu, L. (2011). Öğretmen adaylarının proje tabanlı öğrenme sürecine yönelik görüşleri. 5th International Computer & Instructional Technologies Symposium. Fırat University, Elazığ.

Değirmenci, Ş. (2011). *Fen ve teknoloji dersinde "canlılar ve enerji ilişkileri" ünitesinin öğretilmesinde proje tabanlı öğrenmenin öğrenci başarısına etkisi.* Unpublished master thesis. Konya:Selçuk University, Institute of Educational Sciences.

Demirci, C. (2007). Fen bilgisi öğretiminde yaratıcılığın erişi ve tutuma etkisi. Hacettepe University Educational Faculty Journal, 32. 65-75.

Deniş Çeliker, H. (2012). *Fen ve teknoloji dersi "güneş sistemi ve ötesi: uzay bilmecesi" ünitesinde proje tabanlı öğrenme uygulamalarının öğrenci başarılarına, yaratıcı düşünmelerine, fen ve teknolojiye yönelik tutumlarına etkisi.* Unpublished doctoral dissertation. İzmir: Dokuz Eylül University, Institute of Educational Sciences.

Doğay, G. (2010). *Ekoloji ünitesinin öğrenilmesinde proje tabanlı öğrenme yönteminin öğrenci başarısına etkisi (istanbul ili örneği).* Unpublished master thesis. Ankara: Gazi University, Institute of Educational Sciences.

Elmacı, T. M. (2010). *Çoklu zeka kuramına dayalı öğretimin ortaöğretim dokuzuncu sınıf biyoloji dersi canlıların temel bileşenleri konusunda öğrencilerin akademik başarısına etkisi.* Unpublished master thesis. Ankara: Gazi University, Institute of Educational Sciences.

Fakolade, O. A. & Adeniyi, S. O. (2010). Efficacy of enrichment triad and self-direct models on academic achievement of gifted students in selected secondary schools in Nigeria. *International Journal of Special Education*. 25(1), 10-16.

Gorman, J. C. (2011). *The assocıatıon between grades pre k-12 student achıevement and dıfferentıated instructıonal strategıes in the anytown townshıp school district explored through units of study.* Unpublished doctoral dissertation, Rowan University, USA.

Gözüm, S., Bağcı, U., Sünbül, A. M., Yağız, D. ve Afyon, A. (2005). Özel konya esentepe ilköğretim okulunda yapılan bilim şenlikleri ve proje tabanlı öğrenme yöntemi uygulamalarına yönelik bir değerlendirme. 1st National Modern Approaches Symposium on Science and Technology, Ankara.

Gözüm, A. İ. C. (2011). *Çoklu zeka kuramına göre işlenen enzimler konusunun fen bilgisi öğretmen adayları üzerindeki başarısının incelenmesi.* Unpublished master thesis. Kars: Kafkas University, Institute of Science.

Günay Balım, A. (2006). Fen konularının çoklu zekâ kuramına dayalı öğretiminin öğrencilerin başarılarına ve kalıcılığa etkisi. *Eurasian Journal of Educational Research*, 23, 10-19.

Hallinan, M. T. ve Kubitschek, W. N. (1999). Curriculum differentiation and high school achievement. *Social Psychology of Education*, 3, 41–62.

Hamurlu, M. K. (2007). *Çoklu zeka kuramına göre geliştirilen eğitim durumlarının yabancı dil ağırlıklı lise 9. sınıf öğrencilerinin ingilizce dersindeki başarılarına ve derse ilişkin tutumlarına etkisi.* Unpublished master thesis. Gaziantep: Gaziantep University, Institute of Social Sciences.

Hoffer, T. B. (1992). Middle school ability grouping and student achievement in science and mathematics. *Educational Evaluation and Policy Analysis*, 14(3), 205-227.

Işık, D. K. (2007). *Çoklu zeka kuramı destekli kubaşık öğrenme yönteminin ilköğretim dördüncü sınıf öğrencilerinin matematik dersindeki akademik başarılarına ve kalıcılığa etkisi.* Unpublished master thesis. Adana: Çukurova University, Institute of Social Sciences.

İflazoğlu, A. (2003). *Çoklu zeka kuramı destekli kubaşık öğrenme yönteminin ilköğretim beşinci sınıf öğrencilerinin fen bilgisi dersindeki akademik başarı ve tutumlarına etkisi.* Unpublished doctoral dissertation. Adana: Çukurova University, Institute of Social Sciences.

Kadayıfçı, H. (2008). *Yaratıcı düşünmeye dayalı öğretim modelinin öğrencilerin maddelerin ayrılması ile ilgili kavramları anlamalarına ve bilimsel yaratıcılıklarına etkisi.* Unpublished doctoral dissertation. Ankara: Gazi University, Institute of Educational Sciences.

Kadum-Bošnjak, S., & Buršić-Križanac, B. (2012). Impact of differentiated instruction on achievement in teaching mathematics to lower-stage grades. *Metodički obzori*, 7(15), 15-29.

Karaçallı, S. (2011). *İlköğretim 4. sınıf fen ve teknoloji dersinde proje tabanlı öğrenme yönteminin akademik başarıya, tutuma ve kalıcılığa etkisi.* Unpublished master thesis. Burdur: Mehmet Akif Ersoy University, Institute of Social Sciences.

Karadeniz, N. G. (2006). *Çoklu zeka kuramı tabanlı öğretimin anadolu lisesi 9. sınıf öğrencilerinin ingilizce dersindeki başarılarına ve öğrenilen bilgilerin kalıcılığına etkisi.* Unpublished doctoral dissertation. Isparta: Süleyman Demirel University, Institute of Social Sciences.

Karakoç, İ. & Sezer, A. (2007). İlköğretim II. kademe sosyal bilgiler dersi coğrafya konularının öğretiminde çoklu zekâ uygulamalarının akademik başarıya etkisi. *Turkey Social Researches Journal*. 2, 9-20.

Karasu, N. (2010). *Üstün zeka/yetenek, dil ve konuşma bozukluğu, otizm spektrum bozukluğu.* İ. H. Diken, (Ed.), In İlköğretimde kaynaştırma (163-192). Ankara: Pegem Academy.

Kaşarcı, İ. (2013). *Proje tabanlı öğrenme yaklaşımının öğrencilerin akademik başarı ve tutumlarına etkisi: bir meta-analiz çalışması.* Unpublished master thesis. Eskişehir: Eskişehir Osmangazi University, Institute of Educational Sciences.

Kayıran, B. K. (2007). *Çoklu zeka kuramı destekli kubaşık öğrenme yönteminin türkçe dersine ilişkin tutum ve okuduğunu anlamaya yönelik akademik başarı üzerindeki etkisi.* Unpublished master thesis. Adana: Çukurova University, Institute of Social Sciences.

Kayıran, T. (2009). *Çoklu zekâ kuramı destekli proje tabanlı öğrenme yönteminin sosyal bilgiler dersinde akademik başarı, tutum ve kalıcılığa etkisi.* Unpublished master thesis. Adana: Çukurova University, Institute of Social Sciences.

Keskin, E. (2011). *Proje tabanlı öğrenme yönteminin ilköğretim ikinci kademe öğrencilerinin başarı ve fen motivasyonlarına etkisinin incelenmesi.* Unpublished master thesis. Bursa: Uludağ University, Institute of Educational Sciences.

Kılıç Demirkaya, E. (2006). *İlköğretim okulu müzik derslerinde çoklu zeka kuramı'na dayalı öğretimin 6. sınıf öğrencilerinin başarısına ve öğrendikleri bilgilerin kalıcılığına etkisi. Abant İzzet Baysal University Educational Faculty Journal*. 119-130.

Kirkey, T. L. (2005). Differentiated instruction and enrichment opportunities: an action research report. *The Ontario Action Researcher*, 8(3).

Koç, İ. (2008). *Çoklu zekâ kuramına dayalı olarak gerçekleştirilen proje tabanlı öğrenmenin öğrencilerin 7. sınıf sosyal bilgiler dersindeki tutum ve erişilerine etkisi.* Unpublished master thesis. Konya: Selçuk University, Institute of Social Sciences.

Kök, B. (2012). *Üstün zekalı ve yetenekli öğrencilerde farklılaştırılmış geometri öğretiminin yaratıcılığa, uzamsal yeteneğe ve başarıya etkisi.* Unpublished doctoral dissertation. İstanbul: İstanbul University, Institute of Social Sciences.

Kulik, Chen-Lin C. & Kulik James A. (1982). effects of ability grouping on secondary school students: a meta-analysis of evaluation findings. *American Educational Research Journal*. 19(3), 415-428.

Kurtuluş, N. (2012). *Yaratıcı düşünmeye dayalı öğretim uygulamalarının bilimsel yaratıcılık, bilimsel süreç becerileri ve akademik başarıya etkisi.* Unpublished master thesis. Trabzon: Karadeniz Teknik University, Institute of Educational Sciences.

Lam-Kan, K. S. (1985). The contributions of enrichment activities towards science interest and science achievement. Unpublished Master Thesis. Singapore: National University of Singapore.

Luehmann, A. L. (2009). Students' perspectives of a science enrichment programme: out of school inquiry as access. *International Journal of Science Education*, 31(13), 1831-1855.

Mastropieri, M, A., Scruggs, T. E., Norland, J. J., Berkeley, S., McDuffie, K., Tornquist, E. H. & Connors, N. (2006). Differentiated curriculum enhancement in inclusive middle school science: effects on classroom and high-stakes tests. *The Journal Of Specıal Educatıon,* 40(3), 130–137.

McSheffrey, R. & Hoge, R. D. (1992). Performance within an enriched program for the gifted. Child Study Journal, 22(2), 93-103.

Olah, R. M. (2008). Increasıng student achıevement and motıvatıon by dıfferentıatıng instructıon in an inclusıve hıgh school chemıstry classroom. Unpublished master dissertation, Moravian College, Pennsylvania.

Olszewski-Kubilius, P. & Lee S. Y. (2004). Parent perceptions of the effects of the saturday enrichment program on gifted students' talent development. *Roeper Review*, 26(3), 156-165.

Orhon, G. (2011). Yaratıcılık. nörofizyolojik, felsefi ve eğitsel temeller. (1st Press). Ankara: Pegem.

Öngören, H. ve Şahin, A. (2008). Çoklu zeka kuramı tabanlı öğretimin öğrencilerin fen bilgisi başarılarına etkileri. *Pamukkale University Education Faculty Journal*, 1(23), 24-35.

Özcan, S. (2009). Yaratıcı düşünme etkinliklerinin öğrencilerin yaratıcı düşünmelerine ve proje geliştirmelerine etkisi. Unpublished master thesis. Ankara: Gazi University, Institute of Educational Sciences.

Özdemir, E. (2006). Proje tabanlı öğrenmenin öğrencilerin geometri başarılarına ve geometriye yönelik tutumlarına etkisinin araştırılması. Unpublished master thesis. Ankara: Orta Doğu Teknik University, Institute of Social Sciences.

Özer, D. Z.ve Özkan, M. (2011). Bilgisayar ve öğretim teknolojileri eğitimi (böte) bölümü öğretmen adaylarının biyoloji konularında hazırladıkları projelerin proje tabanlı öğrenme yaklaşımları açısından değerlendirilmesi: Bursa ili örneği. *Uludağ University Educational Faculty Journal,* 24(1), 181-207.

Özerbaş, M. A. (2011). Yaratıcı düşünme öğrenem ortamının akademik başarı ve bilgilerin kalıcılığa etkisi. *Gazi Educational Faculty Journal*, 31(3), 675-705.

Özyılmaz Akamca, G. ve Hamurcu, H. (2005). Çoklu zeka kuramı tabanlı öğretimin öğrencilerin fen başarısı, tutumları ve hatırda tutma üzerindeki etkileri. *Hacettepe University Education Faculty Journal*, 28, 178-187.

Poonpon, K. (2011). Enhancing english skills through project based learning. The English Teacher. Vol. XL: 1-10.

Reis, S. M., McCoach, D. B., Little, C. A., Muller, L. M. & Kaniskan, R. B. (2011). The effects of differentiated instruction and enrichment pedagogy on reading achievement in five elementary schools. *American Educational Research Journal*, 48(2), 462–501.

Rogers, K. B. (1991). The relationship of grouping practices to the education of the gifted and talented learner (research-based decision making series no:9102). Storrs: National Research Center on the Gifted and Talented, University of Connecticut.

Sak, U. (2009). Üstün zekalılar eğitim programları. üstün zekalı ve üstün yetenekli öğrencilerin eğitimlerinde model bir program. (1st Press). Ankara: Maya.

Schack, G. D. (2011). Effects of a creative problem solving curriculum on students of varying ability levels. In D. J. Treffinger (Ed.), Creativity and Giftedness (pp. 125-140). Thousand Oaks, California: Corwin Press.

Scott, G., Leritz, L. E. & Mumford, M. D. (2004). The effectiveness of creativity training: a quantitative review. *Creativity Research Journal*, 16(4), 361–388.

Simpkins, P. M., Mastropieri, M. A. & Scruggs, T. E. (2009). Differentiated curriculum enhancements in inclusive fifth-grade science classes. *Remedial and Special Education*, 30(5), 300-308.

Singh, P. (2013). Accounting enrichment program for gifted high school pupils: Self-regulated learning strategies to develop our future business leaders. *International Business & Economics Research Journal (IBER)*, 12(1), 103-112.

Sivrikaya, A. H. (2009). *Çoklu zeka kuramına dayalı öğretim yönteminin 6. sınıf öğrencilerinde beden eğitimi dersi başarısına etkisi.* Unpublished doctoral dissertation. Ankara: Gazi University, Institute of Educational Sciences.

Şirin, Ö. (2010). *Çoklu zeka uygulamalarının sosyal bilgiler dersinde öğrencilerin akademik başarılarına etkisi.* Unpublished master thesis. Elazığ: Fırat University, Institute of Social Sciences.

Tabuk, M. (2009). *Proje tabanlı öğrenmede çoklu zekâ yaklasımının matematik öğrenme başarısına etkisi.* Unpublished doctoral dissertation. İstanbul: Marmara University, Institute of Educational Sciences.

Taller, S. C. (2004). Seminerin avrupa konseyindeki yeri. 106. Avrupa Semineri Üstün Zekalı/Yetenekli Çocuklar ve Öğrenciler. Web:http://digm.meb.gov.tr/uaorgutler/AK/Rapor_GTurksever.pdf (accessed may 2011)

Temur, O. D. (2007). The effects of teaching activities prepared according to the multiple intelligence theory on mathematics achievements and permanence of information learned by 4th grade students. *International Journal of Environmental and Science Education*, 2(4), 86-91.

Tunçdemir, İ. (2004). Çoksesli müzikte "harika çocuk kanunu"nun türk müzik kültürüne etkisi: İdil Biret-Suna Kan örneği. XIII. National Educational Sciences Council.

Tüzünak, S. (2002). Kim üstün zekalı. Web: www.kirikkalebilsem.com/dokumanlar/ustun.pdf (accessed may 2011)

Uzunöz, A. ve Akbaş, Y. (2011). Coğrafya dersinde çoklu zekâ destekli öğretimin öğrenci başarısı ve kalıcılığa etkisi. *Turkish Educational Sciences Journal*, 9(3), 467-496.

Yalmancı, S. G. ve Gözüm, A. İ. C. (2013). The effects of multıple intelligence theory based teaching on students' achievement and retention of knowledge (example of the enzymes subject). *International Journal on New Trends in Education and Their Implications*, Volume: 4 Issue:3 Article:04, 27-36.

Yıldırım, K. (2006). Çoklu zeka kuramı destekli kubaşık öğrenme yönteminin ilköğretim 4. sınıf öğrencilerinin matematik dersindeki erişilerine etkisi. *Ahi Evran University Kırşehir Educational Faculty Journal*, 7(2), 301-315.

Yıldırım, K. ve Tarım, K. (2008). Çoklu zeka kuramı destekli kubaşık öğrenme yönteminin ilköğretim beşinci sınıf matematik dersinde akademik başarı ve hatırda tutma düzeyine etkisi. *Primary Online*, 7(1), 174-187.

Yıldız, F. (2009). *Proje-tabanlı öğretim yönteminin 6.sınıf öğrencilerinin kelime öğrenme başarıları üzerindeki etkisi.* Unpublished master thesis. İzmir: Dokuz Eylül University, Institute of Educational Sciences.

Yılmaz, O. (2006). *İlköğretim 7. sınıf sosyal bilgiler dersinde "proje tabanlı öğrenme" nin öğrenenlerin akademik başarıları, yaratıcılıkları ve tutumlarına etkisi.* Unpublished master thesis. Zonguldak: Zonguldak Karaelmas University, Institute of Social Sciences.

Yurttepe, S. (2007). *İlköğretim fen bilgisi dersinde proje tabanlı öğrenmenin öğrenci başarısına etkisi.* Unpublished master thesis. Eskişehir: Eskişehir Osmangazi University, Institute of Sciences.

URL-1, http://faculty.stritch.edu/ljloeffler/521/Week2/PBL/project_based_learning_AS.PDF (accessed august 2013)

GENİŞLETİLMİŞ TÜRKÇE ÖZET

"Ortaokul seviyesindeki üstün zekalı öğrencilerin matematik eğitimine yönelik geliştirilen farklılaştırma yaklaşımının üstün zekalı öğrencilerin başarıları üzerinde etkisi var mıdır?" probleminden hareketle araştırma kapsamında şu alt problemlere cevap aranmaktadır: Kontrol ve deney grubundaki üstün zekalı öğrencilerin başarı öntest (mevcut-zenginleştirilmiş-genel) ve sontest (mevcut-zenginleştirilmiş-genel) sonuçları arasında anlamlı bir farklılık var mıdır?

Araştırmanın amacı ortaokula gitmekte olan üstün zekalı öğrencilerin matematik eğitimine yönelik olarak yeni geliştirilen bir farklılaştırma yaklaşımının üstün zekalı öğrencilerin başarıları üzerindeki etkisine bakılarak değerlendirilmesidir.

Araştırma üstün zekalıların matematik dersinde var olan potansiyellerini en etkili şekilde kullanabilmelerine ve başarılarını arttırmalarına yönelik, öğretmen kullanımı ve öğrenci memnuniyeti bakımından da değerlendirilerek bir farklılaştırma yaklaşımı tasarlanması bakımından ve geliştirilen farklılaştırma yaklaşımının hem üstün zekalı öğrenciler hem de üstün zekalı olmayan öğrenciler üzerindeki etkisine bakılması bakımından önem taşımaktadır. Ancak mevcut araştırma kapsamında sadece geliştirilen farklılaştırma yaklaşımının üstün zekalı öğrencilerin başarıları üzerindeki etkisine bakılmıştır.

Mevcut araştırma kapsamında nicel araştırma yöntemine uygun olarak gerçek deneme modellerinden öntest-sontest kontrol gruplu model kullanılmıştır. Ayrıca uygulama öncesinde deney grubu öğrencilerine çoklu zeka alanları envanteri uygulanarak öğrencilerin baskın zeka alanları tespit edilmiş ve sınıf bazında baskın zeka alanlarının dağılımı yüzde ve frekanslarla ifade edilerek tablolaştırılmıştır. Bu bağlamda nicel araştırma desenine uygun olarak betimsel analiz yapılmıştır. Araştırmanın örneklemini İstanbul ili Maltepe ilçesinde bulunan bir özel okulun 5. sınıflarında eğitim görmekte olan toplam 27 üstün zekalı 5. sınıf öğrencisi oluşturmaktadır. Araştırma kapsamında kullanılan veri toplama araçları; Matematik Başarı Testi ve Çoklu Zeka Alanları Envanteridir. Başarı ön test ve son test öğrencilerin soruları hatırlama durumunu ortadan kaldırmak için birbirlerinden farklı olarak hazırlanmıştır. Araştırma kapsamındaki başarı testleri hazırlanırken konularla ilgili mili eğitim müfredatında yer alan kazanımlar göz önünde bulundurularak çeşitli ulusal sınavlarda (Anadolu lisesi-Fen lisesi-Devlet Parasız Yatılılık ve Bursluluk gibi), MEB onaylı matematik ders kitaplarında ve çeşitli online ya da yazılı yayınlarda konularla ilgili çıkmış sorular birebir veya araştırmacılar tarafından çeşitli değişiklikler yapılarak alınmıştır. Bu sorular kullanılarak taslak başarı testleri oluşturulmuştur. Oluşturulan taslak başarı testleri araştırmacı, öğretim üyesi ve 6 matematik öğretmeni tarafından kontrol edilerek testlerin ilgili kazanımlara ve sınıf seviyesine uygunluğu kontrol edilmiştir. Taslak başarı testlerinin çeşitli ilköğretim okullarında konunun ilgili olduğu sınıf düzeyinin bir üst sınıf düzeyinde okuyan öğrencilerle uygulaması yapılmış (1'er sınıf-küçük örneklem) ve testler için öğrencilere verilmesi gerekli zaman belirlenerek, testlerin son kontrolleri yapılmıştır. Sonraki aşamada ise testlerin tekrar konunun ilgili olduğu sınıf düzeyinin bir üst sınıf düzeyinde okuyan öğrencilerle pilot uygulamaları (büyük örneklem-ortalama 200 kişi) yapılarak, elde edilen verilere göre madde analizi (madde toplam-madde kalan-madde ayırtedicilik) yapılmıştır.

Mevcut araştırma kapsamında öncelikle öğrencilerin baskın zeka alanları tespit edilmiş ve baskın zekalara yönelik ve yaratıcılık stratejilerine uygun proje konuları belirlenerek, dersler proje tabanlı olarak işlenmiştir. Öğrencilerin baskın zekâ alanlarının tespitinde Saban (2005) tarafından hazırlanan "Çoklu Zekâ Alanları Envanteri" kullanılmıştır. Envanter likert tipte olup on bölüm ve 80 maddeden oluşmaktadır. Maddeler beşli dereceleme sistemine göre hazırlanmıştır. Envanterin puanlarının değerlendirilmesinde Saban (2005)'ın verdiği "Çoklu Zekâ Alanları Envanteri Değerlendirme Profili" kullanılmıştır. Her öğrenci için envanterin sekiz

bölümünden, kuralına uygun olarak elde edilen puanlar toplanmış ve öğrencilerin baskın zekaları belirlenmiştir. Elde edilen sonuçlar kullanılarak sınıf bazında baskın zekaların dağılımı tablolaştırılarak frekans ve yüzdelerle ifade edilmiştir.

Araştırma kapsamında kontrol ve deney gruplarında dersler uygulama yapılan okullardaki uygulama sınıflarına giren Matematik dersinin sorumlu öğretmeni tarafından yürütülmüştür. Uygulama öncesi öğretmenlerle yapılacak çalışmalarla ilgili bilgilendirme toplantıları yapılmıştır. Ayrıca yine uygulama safhasında kendilerine yol gösterecek dokümanlar kendilerine iletilmiştir. Yapılacak çalışma öğretmenlere detaylı bir şekilde anlatılarak araştırmanın en verimli şekilde gerçekleştirilmesi amaçlanmıştır. Bu bağlamda öğretmenler proje hazırlama, proje hazırlama sürecine rehberlik etme, yaratıcılık, yaratıcılığa dayalı etkinlikler gibi konularda bilgilendirilmiştir ve kendilerine projeleri yönetme yönergesi verilmiştir. Ayrıca araştırmacılar tarafından geliştirilen proje konularıyla ilgili olarak araştırmaya katılan öğretmenlerin de görüşleri alınarak proje konularına son şekilleri verilmiştir. Öğrencilere de yaratıcılıkla, projelerle, proje hazırlama basamaklarıyla ve proje değerlendirme süreciyle ilgili detaylı bilgi verilerek öğrencilerin de uygulama sürecine en iyi şekilde hazırlanmaları hedeflenmiştir. Tüm analizler %95 güven aralığında yapılmış ve $p<0.05$ değerleri istatistiksel olarak anlamlı kabul edilmiştir.

Özel okulda yapılan çalışmada (5. Sınıf-Tablo ve Grafikler) kontrol ve deney gruplarındaki üstün zekalı öğrencilerin uygulama öncesi zenginleştirilmiş kazanım ve genel puanları arasında anlamlı bir farklılık bulunmazken, mevcut puanları arasında kontrol grubu lehine anlamlı bir farklılık vardır. Ancak uygulama sonrası mevcut kazanım, zenginleştirilmiş kazanım ve genel puanları arasında deney grubu lehine anlamlı bir farklılık vardır. Kontrol grubundaki öğrencilerin uygulama öncesi ve sonrası mevcut kazanım, zenginleştirilmiş kazanım ve genel puanlarında düşüş gözlenirken, deney grubundaki öğrencilerin uygulama öncesi ve sonrası mevcut kazanım, zenginleştirilmiş kazanım ve genel puanlarında artış olmuştur. Kontrol ve deney gruplarındaki üstün zekalı öğrencilerin uygulama öncesi başarıları arasında anlamlı bir farklılık bulunmazken, uygulama sonrası başarı puanları arasında deney grubu lehine anlamlı bir farklılık vardır.