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The Effect of Differentiation Approach Developed on Gifted Students

Ahmet S. Ozdemir[1] and Esra Altintas[2]

Faculty of Ataturk Education, Marmara University, Istanbul, 34722, Turkey
[2]Telephone: +905336996091,
E-mail: [1]<aso23@hotmail.com>,[2]<hoca_kafkas@hotmail.com>

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ABSTRACT The aim of the paper is to determine the effect of the developed differentiation approach related to mathematics education of gifted students going to secondary school when compared with the programme of noticing individual differences applied in Science Art Centre on achievement and creative thinking skills of gifted students. In the present paper, in the scope of quantitative research, the model of pre test-post test with control group was used. The working group of the research consists of twelve 6th grade gifted students going to Science Art Centre in Istanbul. When the experimental group to whom the activities designed based on differentiated approach were applied compared with the control group to whom the activities designed related to individual differences noticing programme were applied, achievement scores, creative thinking skills based on fluency, flexibility, originality and elaboration scores and creative thinking skills based on curiosity, imagination, risk-taking and complexity increased in a significant way.

INTRODUCTION

The education of gifted individuals composing 2 percent of the societies, making them productive and using their potential for development of society are important in terms of the prosperity of society, future of society and determining its place in the world nations. Also, educating gifted students according to their abilities and characteristics is important in terms of showing their characteristics such as talent, creativity, leadership, being at peace with himself and adapting himself to the environment. On the other hand, if gifted students are not directed properly, they can harm themselves and their environments in order to be unable to find self-fulfillment opportunities (Milli Egitim Bakanligi 2013).

The National Association for Gifted Children (2010) defines giftedness as "gifted students are those who demonstrate outstanding levels of aptitude (defined as an exceptional ability to reason and learn) or competence (documented performance or achievement in top 10 percent or rarer) in one or more domains". Domains include any structured area of activity with its own symbol system (for example, mathematics, music, language) and/or set of sensory motor skills (for example, painting, dance, sports). Characteristics of a gifted child can be outlined as follows: Thoughtfully interrelating complex knowledge from multiple subject areas; Having exceptional insight to themes and generalizations; Demonstrating sophistication in learning and applying new information to tasks; Asking provocative questions which probe and analyze problems; Giving diverse, thought-provoking responses which lead to innovative solutions; Insightfully evaluating information and ideas; Creating products that synthesize ideas from a variety of challenging sources and Initiating and going beyond required assignments (Henrico County Public Schools 2014).

For fulfilling the educational needs of gifted students, the primary objective of an educator should be to prepare goals and objectives at the satisfactory levels on the subjects which will be suitable to the developmental features of gifted students and which will attract their attentions and will be according to their levels. For this reason, it is important to provide mathematics education which is suitable to the features of gifted students (Battal Karaduman 2010). It is necessary to provide an education in the quality of making gifted students think about mathematics, teaching them mathematics in details, and improving their creativity, meta-cognitive and abstract skills (Aygun 2010).

Gifted children need to be recognized and understood by their environment, an educational model in which they can be recognized and use their own skills during their education, in addition to provide an education which will help them to improve their skills, they also need to

have suitable opportunities, they need variety of sources to access more information, they need to engage with different activities in which they can improve and display their skills, they need guidance about gaining planned and regular study habits, they need physical environment and conditions in which they can improve and display their skills and it is paid attention to their opinions, efforts and where they can have opportunities to implement their thoughts and they need an educational program which is properly differentiated and which allows to establish connections between related subjects; suitable to enrichment by elaborating the subjects (Sari 2015) and to cover the other issues (Battal Karaduman 2010).

The general objective of any approach regarding enrichment is to increase the quality and level of learning experiences for all students in any and all parts of the curriculum (Renzulli and Reis 2008a). The basic purpose of teaching enrichment is to provide independent and productive learning instead of dependent and passive learning (Renzulli and Reis 2008b).

Differentiation can be defined through the target group and their needs, interests and skills; the attainments and content of the teaching subject; how the pedagogy will be used for teaching content, attainment and both and where the education will take place for implementing the curriculum effectively (Kaplan 2009). The differentiation involves the effort of teacher to answer all the students in class. Differentiation means making education suitable for fulfilling individual needs (Tomlinson 2000). Multiple intelligences can be used to fulfil the individual needs. Multiple intelligences approach is used in the establishment of new schools, in defining the individual differences, in planning and developing curriculums and in evaluating educational strategies. It is widely used in terms of its practicability to implement with different subjects, grade levels and students (VanTassel Baska and Brown 2009).

The purpose of science art centre (SAC), one of the institutions in which gifted children get education in our country, is to help pre-school children and primary/middle school students to become productive individuals who have the ability for solving problems and who can combine scientific thinking and behaviours with artistic values by improving their giftedness through special education techniques (Tusside 2009). In SACs thinking skills education is provided by discovering the skills of the students in early ages. The project-based education suitable to the skills and interests of the students is provided by improving scientific studying and group work skills of the students (Yildiz 2010).

The students are grouped according to their individual differences through observations and feedbacks carried out in compliance and support programs by paying attention to their potentials within the scope of the individual differences noticing programme which is implemented in SACs in Turkey. The programs are prepared for disciplines concerning with individual differences and uncovering students' creativity on the basis of academic information in order for them to recognize the skills that they have. Learning environments are equipped with modern educational tools supporting creativity. The programs are student-centred and interdisciplinary (Tebligler 2007).

There are some curriculum models which are being implemented in all over the world, involving ways for answering the needs of gifted students and providing a system for designing and organizing a curriculum which is suitable for the education of gifted students (VanTassel-Baska and Brown 2009). Some of them are Maker Matrix, Maker model, Williams model, Kaplan model and Autonomous Learner model.

The Maker Matrix model is developed for classifying the content, process, environment and product dimensions of an education program which is suitable for gifted children (VanTassel-Baska and Brown 2009, citation, Maker 1982). It includes five problem types for using it with each intelligence domains (VanTassel-Baska and Brown 2009, citation, Maker et al. 1994). Williams model is composed of three dimensions which is based on creative person and processing operations (New South Wales Department of Education and Training 2004a). It is a curriculum differentiation model.This model is used by teachers to promote different approaches about integrating cognitive and affective domains in teaching and learning in a classroom composed of students who have different skills (New South Wales Department of Education and Training 2006).

Maker model is developed as a curriculum differentiation model. Some adaptations are made to curriculum in content, process and product dimensions on the basis of Maker model (New

South Wales Department of Education and Training 2004b). Maker model is a set of strategies which shows how to differentiate basic curriculum according to individual features of gifted students (Sak 2009).Kaplan model also analyzes curriculum differentiation in terms of content, process, product and learning environment. Kaplan model is an example and a thinking tool for planning a differentiated curriculum (New South Wales Department of Education And Training 2004b). Autonomous LearnerModel is a curriculum model which is discussed in 5 basic dimensions and which includes compliance, individual improvement and enrichment activities, seminars and detailed studies for the education of gifted students (VanTassel-Baska and Brown 2009).

The purpose of this paper is to develop a differentiation approach for teaching mathematics to the middle school gifted students and to determine the effect of this differentiation approach developed on the achievements and creative thinking skills of these gifted students. Besides, it is to determine the effect of differentiation approach developed on the achievement and creative thinking skills of students by comparing it with the lessons carried out within the scope of the programme of noticing individual differences implemented in SAC.

The paper is important in terms of designing a differentiation approach intended for gifted students to be able use their existing potentials most effectively in mathematics lessons and to be able to improve their achievement levels and creative thinking skills. The effect of this differentiation approach on creativity was assessed by using Torrance creative test by considering cognitive factors of creativity and by using Williams creativity scale (Test of Divergent Feeling) by considering the affective temperament factors of creativity. In this sense, it was tried to put forward the effect of this differentiation approach on creativity with more sound evidences by calculating creativity score according to both cognitive and affective factors.In this regard, this paper has great importance.

The answers of the following sub-problems were searched by moving from the problem as 'Is there an effect of this differentiation approach developed for teaching mathematics to the middle school gifted students on the achievements and creative thinking skills of gifted students when it is compared with the programme of noticing individual differences?' according to the purpose of the paper which was carried out with gifted middle school students:

1. Is there a significant difference between the control and experimental group gifted students' achievement test scores before and after implementation?
2. Is there a significant difference between control and experimental group gifted students' creative thinking skills before and after implementation?

METHODOLOGY

The Model of the Research

A quantitative research design was used in this paper. Pre-test post-test with control group model was used within the scope of this quantitative research and the effect of the developed differentiation approach on the achievements and creative thinking skills of gifted students was analyzed.

Universe and Sample

The universe of this paper which is carried out in the fall semester of 2012-2013 school years is composed of all the gifted 6th grade students who are studying in middle schools in Atasehir district of the city of Istanbul and the sample of this paper is composed of 12 gifted 6th grade students who are studying in SAC.

The reason for studying with this size of a sample group within the scope of this paper is the limited number of students who are studying in SAC which are only teaching with gifted students. This paper is a part of the doctoral thesis of the researcher and it is particularly about comparing developed differentiation approach with the programme of noticing individual differences carried out in SAC.

In this paper, convenience sampling was carried out within the scope of quantitative sampling as a result of determining the implementation school through the administrators and teachers whom the researcher has known before because of some practical reasons such as the problems of getting permission, ease of transportation, carrying out the implementation with necessary attention and ease of communication.

Data Collection Instruments

Mathematical Achievement Test

The paper was carried out with 6th grade gifted students. A teaching practice was conducted on 'Tables and Graphics' subject with gifted students who are studying in 6th grade. While preparing the achievement tests for the paper, the objectives stated in the National Education curriculum were considered and draft achievement testswere created. The compatibility of the draft teststo the related objectives and grade levels was analyzed through checking these tests by the researcher, an academician and a mathematics teacher.

The draft achievement test was carried out with students who are studying in one upper grade level than the grade level of the related subject in some different primary schools (One class each and small sample) and final control of the tests were made by deciding the necessary time needed to be given for tests. In the next level, item analysis (total item-remaining item-item discrimination) of the tests were made according to the obtained data by having pilot implementation (big sample- approximately 200 persons) with students who are studying in one upper grade level than the grade level of the related subject. The tests prepared werefound reliable as the result of the item analysis and Cronbach alpha values for pre-test and post-tests were found as respectively 0.858 and 0.760.

Torrance Creative Thinking Test

Torrance creative thinking test was composed of figural and verbal tests (Cramond et al. 2005). There were two forms as A and B in each test (Cramond et al. 2005 cited in Torrence 1996, 1974). Figural A and B forms can be used as pre-test and post-test (Gifted Education 2005). The validity, reliability and construct validity of the test was analyzed and it was determined that the test reached desired results in terms of linguistic equivalence, reliability and validity studies (Aslan 2001).

Total creativity score was obtained in this paper by considering flexibility, fluency, originality and elaboration scores which are known as the cognitive factors of the creativity. Verbal creativity test was conducted for calculating flexibility scores since there was not flexibility subdimension in Torrance figural creativity test. In this sense, figural forms of Torrance creativity tests (A and B Forms) were used for obtaining fluency, originality and elaboration scores and verbal forms (A and B forms) were used for obtaining flexibility scores. The overall creativity score was obtained by calculating the arithmetic mean after converting them into 100. Torrance figural and verbal creativity tests (A and B Forms) were used as pre-test and post–test when comparing lessons carried out with activities based on the developed differentiation approach and lessons carried out with activities stated at the related subject in the programme of noticing individual differences Cronbach alpha coefficient for the Torrance creativity test used within the scope of this paper was found as 0.820.

Williams Test of Divergent Feeling

Test of Divergent Feeling was designed for testing affective creative components of the creativity. As a result of the test, feeling creative overall score which is based on curiosity, complexity, imagination and risk-taking is obtained. The scale is in likert type and consisted of 50 items which students will answer individually (Claxton et al. 2005). Among these items, there are 12 items for curiosity and imagination and 13 items for risk-taking and complexity (Williams 1993). Williams creativity evaluation scale was adapted to Turkish culture by Erdogdu (2005). In this paper, the scale was conducted to 12 sixth grade students who are studying in Science and Art Centre and Cronbach alpha value was found as 0.67.

Multiple Intelligences Inventory

'Multiple-Intelligences Inventory' which was prepared by Saban (2005) was used for determining the dominant intelligence domains of the students. The inventory was in likert type and 'Multiple-Intelligences Inventory Evaluation Profile' which was provided by Saban (2005) was used for the evaluation. While determining dominant intelligence domains, students' scores from Multiple-intelligences inventory were considered and students' level of development in intelligence domains was determined as 'highly developed' for the students whose total score is between 32 and 40 in intelligence domain. Project topics were prepared by considering the dominant intelli-

gence domains of the students. Students or group of students were asked to choose the suitable one among projects which were determined according to their dominant intelligence domains.

Research and Implementation Process

The lessons in the control and experimental groups were carried out by the teacher who was responsible from the mathematics lessons in the implementation classes of the school where this research was conducted. Before implementation, informative meetings were made with the teachers about the studies that would be carried out. Besides, the documents that would guide them during implementation were given to them.It was aimed to carry out research in an optimum way by explaining the activities that would be carried out to the teacher in details. In this sense, the teacher was informed about subjects such as preparing a project, guidance while preparing a project and creativity and the instruction for guiding the projects was given to him/ her. Besides, the project themes which were developed by the researcher were finalized by taking the opinions of the teacher. It was aimed to prepare students to implementation phase ideally by giving them detailed information about creativity, projects, steps for preparing projects and project evaluation process.

Within the scope this paper, the lessons which were designed according to the differentiation approach developed by the researcher were compared with the lessons carried out within the frame of differentiation studies (the programme of noticing individual differences) about the subject in SAC. Torrance creative thinking figurativeand verbal thinking tests(A and B forms), achievement test, Test of feeling divergent were conducted as pre-test and post-test, to students. In this sense, Torrance creative thinkingfigurative-verbal tests (A forms) and test of feeling divergent were conducted to students at the first week of the implementation. Control and experimental groups were specified by conducting achievement pre-test in the second week and multiple intelligences inventory was only conducted to experimental group students before implementation. At the third week of the implementation, students were grouped according to their intelligence domains determined according to multiple intelligence inventoryand students were asked to make a choice among alternatives that were presented to them regarding the project themes which were determined by considering multiple intelligences, creative strategies and the objectives of the subject. After this briefing lasting one lesson, students were asked to complete their projects by having two-week preparation time. From the fifth week, lessons in the control group were carried out on the basis of the program for recognizing individual skills and in the experimental group on the basis of developed differentiation approach. For both control and experimental group the time allocated for covering the subject is equal to the amount of time allocated for this subject in public schools (3x(55'+55')-3Weeks). Achievement post-test, Torrance creative thinkingfigurative-verbal tests (B forms) and the test of feeling divergent were carried out right after teaching.

Teaching Material

In terms of developing a curriculum differentiation approach, in a topic which was selected from National Education curriculum of Turkey, some differences were made in content, process, product and learning environment. While making these differences, content, process, product and learning environment dimensions were defined as in the following: *Content*= Enriched Attainments + Theme (Topic in National Education Curriculum and content), *Process*= Determination of Students' Multiple Intelligence Domains + Teachers' Strategies + Basic Skills + Research Skills + Production Skills, *Product*= Products, *Learning Environment*= Creative Thinking + Multiple Intelligence Different Disciplines + Project-based.

Since enriched attainments were important in terms of determining the topic, they were dealt with theme in the content dimension. Since the determination of multiple intelligences of students would affect strategies of teachers and projects of students, it was dealt with in process dimension. Current grade level's attainments were given in Theme part. 'The Determination of Multiple Intelligences of Students', 'Enriched Attainments' and 'Strategies of Teachers' were added in the differentiation approach which was developed as an addition to the theme, basic skills, research skills, productive skills and products stated in the lesson plan of Kaplan model.

The multiple intelligences of students were determined and the results obtained were used in determining the project topics of students,

selection of teacher's strategies and in determining what to consider for motivating students. During the enrichment of the attainments phase, enrichment was made by selecting attainments from an upper grade. In using strategies, strategies stated at the second dimension of the Williams model had been considered and some of them were skipped and new strategies were added. These are; intriguing question, property listings, analogy, visualization, interdisciplinary approach, depending on uncertainty, intuitive expression, evaluation of cases, organized random research, research skill, creative reading skills, creative listening skills, discrimination, topic relation, historical perspective, change samples, contradiction, creative writing skills, creative process study.

While designing differentiation model, the models of Williams, Maker, Kaplan, Autonomous Learner, Maker Matrix and multiple intelligences of Gardner were used. Among the 5 problem types stated within the scope of Maker matrix model, Type III and Type V were especially emphasized. Project topics were presented to students by determining the outlines of the topics. Students were responsible from all stages in projects.

In the developed differentiation approach, both vertical and horizontal enrichment were made. For this, enrichments were made both in attainment and activity dimensions. Within the scope of the designed differentiation approach, it was examined that the strategies in Williams' model fit to which process changes in Maker model. The purpose here is to determine process changes that will be done in curriculum via the strategies that will be used according to subjects. Students developed some products through strategies. These are evaluated by their teachers and peers through listening. Students who are making the presentations are subjected to 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, 'The Information Process' among the skills which are included within the scope of research skills in the process phase of Kaplan model was entitled as Preparing Project Stages after editing by the researcher and the lecturer. Students were asked to prepare projects by considering these stages. While evaluating projects, an evaluation form was prepared by depending on 'information skills' part of the information process.

Data Analysis

All the analyses were made in 95 percent confidence interval and $p<0.05$ values were accepted as statistically significant. When analyzing pilot studies of the achievement tests, scores were taken as the number of correct answers. However, when determining control and experimental groups, scores were calculated by converting them into 100-scale grading system in the analyses of the achievement tests.

The item remaining, item discrimination and item-total indices were calculated by conducting item analysis to achievement tests after pilot study and accepting the significance level as 0.05. While analyzing achievement tests, current objective, elaborated objective and overall objective scores were calculated. Current objective scores were reflecting the scores obtained from questions including related subject's objective in the grade level where the research was carried out,elaborated objective scores were reflecting the scores obtained from questions including the objectives of the next grade level and overall objective score was reflecting the score obtained from the test in general.

The equivalence of the scores out of 100 obtained from Torrance verbal and figural forms, Williams creativity scalewere calculatedand the analyses were carried out according to these scores. Non-parametric tests were used in the analysis of the data since the number of students per class is less (The number of data is less than 30 (Kalayci 2009; Baydur 2012)). The data which was collected by using multiple intelligences inventory were analyzed and the intelligences who got a score between 32 and 40 from the inventory were accepted as 'highly developed' and finally the dominant intelligence domains of the students were determined.

RESULTS

Achievement Test Analysis

When the data distribution is not normal (Eymen 2009) or the size of the sample is very small (between 5 and 20) (Nachar 2008) Mann Whitney U test is used. With the help of this test, whether or not there is a significant difference between the scores obtained from two unrelated samples is tested (Buyukozturk 2006).

Mann Whitney U test is a non-parametric equivalent of the independent group t test (Kalayci 2009). Wilcoxon signed ranks test is used for testing the significance of the difference between the scores of related two measurement sets.It is preferred instead of related t-test when differentiation scores of the samples do not show a normal distribution (Buyukozturk 2006). Since the size of the sample is small within the scope of this research, non-parametric tests were used.

The results of Mann Whitney–U Test Comparison Regarding Achievement Test Scores (Overall-Current-Elaborated Objective) of Gifted Students in Control and Experimental Groups Before and After Implementation are shown in Table 1.

While there is not a significant difference between the current objective scores of the gifted students in control and experimental groups before implementation (U=17.500, p=0.934>0.05), there is a significant difference between current objective scores in favour of experimental group after implementation (U=0.000, p=0.003<0.05). While there is not a significant difference between the elaborated objective scores of the gifted students in control and experimental groups before implementation (U=18.000, p=1.000>0.05) there is a significant difference between elaborated objective scores in favour of experimental group after implementation (U=0.000, p=0.003<0.05). While there is not a significant difference between the overall objective scores of the gifted students in control and experimental groups before implementation (U=17.500, p=0.935>0.05) there is a significant difference between the overall objective scores in favour of experimental group after implementation (U=0.000, p=0.003<0.05) (see Table 1).These results show that there was an increase in the current, elaborated and overall scores regarding achievement scores of the gifted students in the experimental group after implementation.

The results of Wilcoxon Signed Ranks Test Comparison Regarding Overall, Current and Elaborated Objective Scores of Gifted Students in Control and Experimental Groups Before and After Implementation were shown in Table 2.

There is a significant difference in favour of pre-test between control group gifted students' current objective scores before and after implementation (z=-2.214, p=0.027<0.05). However, there is not a significant difference between control group students' elaborated (z=-1.997, p=0.080>0.05) objective scores before and after implementation and general (z=-1.897, p=0.058>0.05) objective scores before and after implementation. There is a significant difference in favour of post-test between experimental group students' before and after implementation current (z=-2.041, p=0.041<0.05) objective, elaborated (z=-2.207, p=0.027<0.05) objectiveandoverall (z=-2.201, p=0.028<0.05) objective scores (see Table 2).These results show that while there was an increase in the current, elaborated and overall scores of gifted students in experimental group after implementation, there was a decrease in current objective scores of students in the control group and there was not a significant difference between their overall and elaborated objective scores after implementation.

Torrance Creativity Analysis

The results of Wilcoxon Signed Ranks Test Comparison Regarding Creativity Test Scores of

Table 1: Mann Whitney – U Test comparison regarding achievement test scores (Overall-Current-Elaborated Objective) of gifted students in control and experimental groups before and after implementation

Score	*Group*	*N*	*Mean rank*	*Rank sum*	*U*	*P*
Pre-overall	Control	6	6.58	39.50	17.500	0.935
	Experimental	6	6.42	38.50		
Post-overall	Control	6	3.50	21.00	0.000	0.003
	Experimental	6	9.50	57.00		
Pre-current	Control	6	6.58	39.50	17.500	0.934
	Experimental	6	6.42	38.50		
Post-current	Control	6	3.50	21.00	0.000	0.003
	Experimental	6	9.50	57.00		
Pre-elaborated	Control	6	6.50	39.00	18.000	1.000
	Experimental	6	6.50	39.00		
Pre-elaborated	Control	6	3.50	21.00	0.000	0.003
	Experimental	6	9.50	57.00		

Table 2:Wilcoxon signed ranks test comparison regarding overall, current and elaborated objective scores of gifted students in control and experimental groups before and after implementation

Group	*Score*	*Pre-test-post-test*	*N*	*Mean rank*	*Rank sum*	*z*	*p*
Control	Pre-overall Post- overall	Negative Rank	5	3.90	19.50	-1.897	0.058
		Positive Rank	1	1.50	1.50		
		Equal	0				
	Pre-current-Post-current	Negative Rank	6	3.50	21.00	-2.214	0.027
		Positive Rank	0	0.00	0.00		
		Equal	0				
	Pre-elaborated	Negative Rank	1	1.00	1.00	-1.997	0.080
	Post-elaborated	Positive Rank	4	3.50	14.00		
		Equal	1				
Experimental	Pre-overall Post- overall	Negative Rank	0	0.00	0.00	-2.201	0.028
		Positive Rank	6	3.50	21.00		
		Equal	0				
	Pre-current-Post-current	Negative Rank	0	0.00	0.00	-2.041	0.041
		Positive Rank	5	3.00	15.00		
		Equal	1				
	Pre-elaborated Post-elaborated	Negative Rank	0	0.00	0.00	-2.207	0.027
		Positive Rank	6	3.50	21.00		
		Equal	0				

Gifted Students in Control and Experimental Groups Before and After Implementation were showed in Table 3.

There is a significant difference in favour of pre-test between the overall (z=-2.032, p=0.042<0.05) scores of gifted students in control group before and after implementation. There is a significant difference in favour of post-test between the overall (z=-2.207, p=0.027<0.05) scores of gifted students in experimental group before and after implementation. (see Table 3).These results show that there was an increase in creativity scores of gifted students in experimental group after implementation.

The results of Mann Whitney-U Test Comparison Regarding Creativity Test Scores of Gifted Students in Control and Experimental Groups Before and After Implementation were showed in Table 4.

There is not a significant difference between the overall (U=11.500, p=0.293>0.05) scores of gifted students in control and experimental groups. There is a significant difference in favour of experimental group between the overall

Table 3: Wilcoxon signed ranks test comparison regarding creativity test scores of gifted students in control and experimental groups before and after implementation

Group	*Score*	*Pre-test-post-test*	*N*	*Mean rank*	*Rank sum*	*z*	*p*
Control	Post-overall Pre- overall	Negative rank	5	3.00	15.00	-2.032	0.042
		Positive rank	0	0.00	0.00		
		Equal	1				
Experimental	Post-overall Pre- overall	Negative rank	0	0.00	0.00	-2.207	0.027
		Positive rank	6	3.50	21.00		
		Equal	0				

Table 4:Mann Whitney-U Test comparison regarding creativity test scores of gifted students in control and experimental groups before and after implementation

Score	*Group*	*N*	*Mean rank*	*Rank sum*	*U*	*p*
Pre-Overall	Control	6	7.58	45.50	11.500	0.293
	Experimental	6	5.42	32.50		
Post-Overall	Control	6	3.50	21.00	0.000	0.004
	Experimental	6	9.50	57.00		

(U=0.000, p=0.004<0.05) scores of the groups after implementation (see Table 4).These results show that while a significant difference is not observed between creativity scores of gifted students in control and experimental groupsbefore implementation, there is a significant difference in favour of experimental group between the creativity scores after implementation.

Williams Creativity Analysis

The results of Mann Whitney-U Test Comparison Regarding Creativity Test Scores of Gifted Students in Control and Experimental Groups were shown in Table 5.

There is not a significant difference between the pre-creativity (U=18.000, p=1.000>0.05) scores of gifted students in control and experimental groups. But there isa significant difference in favour of experimental group between the post-creativity (U=3.500, p=0.020<0.05) scores of gifted students in control and experimental groups (see Table 5). These results show that while a significant difference is not observed between creativity scores of gifted students in control and experimental groups before implementation, there is a significant difference in favour of experimental group between the creativity scores after implementation.

The results of Wilcoxon Signed Ranks Test Comparison Regarding Creativity Test Scores of Gifted Students in Control and Experimental Groups were shown in Table 6.

There is significant difference in favour pretest for the control group and in favour of posttest for the experimental group between the creativity scores (z=-2.023, p=0.043<0.05) of gifted students in control group before and after implementation and between the creativity scores (z=-2.201, p=0.028<0.05) of gifted students in experimental group before and after implementation (see Table 6).These results show that there was a decrease in the creativity scores of gifted students in control group after implementation and there was an increase in the creativity scores of gifted students in experimental group after implementation.

DISCUSSION

Achievement Test

In this paper, while there is not a significant difference between the current objective, elaborated objective and overall objective scores of gifted students in control and experimental group before implementation, there is a significant difference in favour of experimental group between the current objective, elaborated objective and overall objective scores of gifted students in experimental group after implementation. While a decrease is observed in current objective scores of students in control group before and after implementation, there was not a change in elaborated objective and overall objective scores. There was an increase in current objective, elaborated objective and overall objective scores of students in experimental group.

Table 5: Mann Whitney-U test comparison regarding creativity test scores of gifted students in control and experimental groups

Score	*Group*	*N*	*Mean rank*	*Rank sum*	*U*	*p*
Pre-creativity	Control	6	6.50	39.00	18.00	1.000
	Experimental	6	6.50	39.00		
Post-creativity	Control	6	4.08	24.50	3.500	0.020
	Experimental	6	8.92	53.50		

Table 6: Wilcoxon Signed ranks test comparison regarding creativity test scores of gifted students in control and experimental groups

Group	*Score*	*Pre-test-post-test*	*N*	*Mean rank*	*Rank sum*	*z*	*p*
Control	Post-creativity-Pre-creativity	Negative rank	5	3.00	15.00	-2.023	0.043
		Positive rank		0	0.00	0.00	
		Equal	1				
Experimental	Post-creativity-Pre-creativity	Negative rank	0	0.00	0.00	-2.201	0.028
		Positive rank		6	3.50	21.00	
		Equal	0				

The present paper coincides with the papers of Kurtulus (2012) and Kok (2012) in terms of observing that teaching practices which is based on creative thinking and in addition to creativity, making differentiation studies by depending on a teaching model increase the achievements of students. The present paper coincides with the papers of Poonpon (2011), Denis Celiker (2012), Kasarci (2013), Krajcik and Czerniak (2014), Varisoglu and Sevim (2014), Karacalli and Korur (2014), Ergul and Keskin Kargin (2014) in terms of observingthat there is an increase in students' achievements, positive attitudes towards the lesson and the retention of the lesson in practices depending on project-based teaching approach. The present paper coincides with the papers of Kayiran (2009), and Bas and Beyhan (2010) in terms of observing that using multiple intelligence approach in project-based teaching and cooperative learning increase students' achievements. The present paper coincides with the paper of Adodo and Agbayewa (2011) in terms of observing that skill grouping or homogenous grouping is effective on academic achievements of gifted students. The present paper coincides with the papers of Altinsoy (2011), Uzunoz and Akbas (2011), Yalmanci and Gozum (2013), Tai (2014), Saadatmanesh (2014) in terms of finding that teaching with multiple intelligence theory increased academic achievements of students.

The present paper coincides withthe papers of Fakolade and Adeniyi (2010), Al-Zoub (2011), Singh (2013)in terms of specifying that teaching with enrichment activities increased students' achievement. Also, the present paper coincides with the papers of Kadum-Bošnjak and Buršic-Kri•anac (2010), Reis et al. (2011) and Gorman (2011) in terms of appearing that curriculum differentiation studies increased students' achievements.

Creativity Test

It is seen in this paper that there was a decrease in the Torrance creativity scores of gifted students in control group after implementation. There was an increase in the creativity scores of gifted students in experimental group after implementation. While there was no difference between the creativity scores of groups before implementation, there was a significant difference in favour of experimental group after implementation. While there was no difference between the Williams creativity scores of gifted students in control and experimental groups before implementation, there was a significant difference in favour of experimental group after implementation. While Williams creativity scores of gifted students in control group decreased after implementation, there was an increase in creativity scores of students in experimental group.

The present paper coincides withthe papers of Kadayifci (2008), Ozcan (2009), Karatas and Ozcan (2010), Kok (2012), Kurtulus (2012) in terms of concludingthat teaching practices based on creative thinking increase creative thinking skills. The present paper coincides with the paper of Kok (2012) in terms of concluding that in addition to creativity, differentiation studies based on a teaching model also increase creative thinking skills.The present paper coincides with the papers of Yildiz (2012) and Denis Celiker (2012) in terms of observing that practices based on project-based learning increase creative thinking skills. The present paper coincides with the papers of Nogueira (2006), Garcia-Cepero (2008), Aljughaiman and Ayoub (2012) in terms of concluding that lessons based on enrichment activities increase creative thinking skills of the students.

CONCLUSION

In this paper, while there is not a significant difference between current objective, elaborated objective and overall objective scores regarding the achievement test of the gifted students in control and experimental groups before implementation, there is a significant difference in favour of experimental group between current objective, elaborated objective and overall objective scores. While a decrease is observed in current objective scores of students in control group before and after implementation, there is no change in elaborated objective and overall objective scores.There was an increase in the current, elaborated and overall objective scores of experimental group students.

In the paper, it is seen that there is a decrease in the Torrance creativity scores of gifted students in control group after implementation. There was an increase in the creativity scores of gifted students in the experimental group after implementation. While a significant difference is not observed between the creativity scores of control and experimental groups before imple-

mentation, there is a significant difference in favour of experimental group after implementation.

While a significant difference is not observed between the Williams creativity scores of control and experimental groups before implementation, there is a significant difference in favour of experimental group after implementation.While the Williams creative scores of gifted students in control group decreased after implementation, there was an increase in the creativity scores of students in the experimental group.

RECOMMENDATIONS

The following suggestions are offered as a result of this paper.

1. It is suggested to implement this developed differentiation approach with other grade levels in addition to grade level stated in this paper, with other subjects and in different lessons.
2. It is suggested to re-design the project topics which were designed according to the developed differentiation approach by considering various process changes and different strategies on creativity.
3. It is suggested to use this differentiation approach periodically for allowing teachers and students to gain experience.
4. It is suggested to obtain an overall or a separate creativity score by considering all the sub-dimensions stated in the original evaluation of the Torrance creativity test.
5. It is suggested to examine the correlation between Torrance creativity scores and Williams creativity scores obtained within the scope of this paper.
6. It is suggested to collect data by practicing differentiation method trough determining nationwide pilot schools.
7. It is suggested generally to inform all teachers across the country about how they will guide the process of preparing projects and for teachers to inform their students about how they will prepare projects.
8. It is suggested to develop approach and models with the purpose of supporting the education of gifted children by considering the current situation peculiar to our country in education and in addition to this the opinions of teachers should be collected.
9. It is suggested to analyze the long-term effects of the developed differentiation approach on the creativity by carrying out longitudinal studies based on this developed differentiation approach.

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