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THE RELATIONSHIP BETWEEN STUDENTS' MULTIPLE INTELLIGENCES AREAS, GENDER, NUMBER OF SIBLINGS AND PHYSICS SUCCESS[1,2]

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ABSTRACT

This study examines the influence of gender and number of siblings on the development of high school students' multiple intelligences areas. Also, it examines the relationship between multiple intelligences applications assisted with FATIH project, multiple intelligences areas and students' physics success. The sample of the study has consisted of 200 students (78 males and 122 females) from the ninth class of two schools of Yuksekova district of Hakkâri city (Turkey). In the research, the TOKI Anatolian High School and the Semsettin Onay Anatolian High Schools in Yuksekova were chosen as application schools. "Multiple Intelligences Areas Inventory for Students (Oral, 2006)", "Multiple Intelligences Areas Profiles for Students (Saban, 2004)" and "Physics Success Test" were used as a data collection tool. Mean, Standard deviation, T-Test and ANOVA were used for analyzing the data. The findings of the study reveal that there is a significant influence of the number of siblings on development of verbal-linguistic intelligence area. It is figured out, that male students' logical–mathematical intelligence, bodily-kinesthetic intelligence and social-interpersonal intelligence are more developed than the females'. On the other hand, it is found out that a group of logical-mathematical intelligence area is more successful among all bits of intelligence groups.
Keywords: Siblings number, Gender, FATIH Project, Multiple-intelligences theory, Physics.

ÖZET

Bu çalışma cinsiyet ve kardeş sayısının lise öğrencilerinin çoklu zekâ alanlarının gelişimi üzerindeki etkisini incelemektedir. Ayrıca, Fatih projesiyle desteklenen çoklu zekâ uygulamaları, çoklu zekâ alanları ve öğrencilerin fizik başarısı arasındaki ilişkiyi incelemektedir. Araştırmanın örneklemini, Hakkâri ili Yüksekova ilçesinde bulunan iki okulun dokuzuncu sınıfından 200 öğrenci (78 erkek ve 122 kız) oluşturmaktadır. Araştırmada Yüksekova'daki TOKİ Anadolu Lisesi ve Şemsettin Onay Anadolu Liseleri uygulama okulları olarak seçilmiştir. Veri toplama aracı olarak "Öğrenciler İçin Çoklu Zekâ Alanları Envanteri (Oral, 2006)", "Öğrenciler için Çoklu Zekâ Alanları Profilleri (Saban, 2004)" ve "Fizik Başarı Testi" kullanılmıştır. Verilerin analizinde ortalama, standart sapma, t-testi ve Anova kullanılmıştır. Çalışmanın bulguları kardeş sayısının sözel-dilsel zekâ alanının gelişimi üzerinde önemli bir etkisi olduğunu ortaya koymaktadır. Erkek öğrencilerin "mantıksal - matematiksel zekâ, bedensel-kinestetik zekâ ve sosyal-kişilerarası zekâlarının kadınlardan daha gelişmiş olduğu" tespit edilmiştir. Diğer taraftan, mantıksal-matematiksel zekâ alanı grubunun tüm zekâ grupları arasında daha başarılı olduğu tespit edilmiştir.
Anahtar Kelimeler: Kardeş sayısı, Cinsiyet, Fatih Projesi, Çoklu zekâ kuramı, Fizik.

1. INTRODUCTION

All events happen around us are related to physics principles. Therefore, physics science tries to describe what happens in the universe by observations, experiments and measurements using the language of mathematics. The progress in physics science helps develop the technology. The leading countries in the 21st century show their power with their technological improvements. Therefore, it is vital to growing

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up to new generations who are capable of understanding different technological improvements (Oral & Guzel, 2018). Many researchers have figured out that the majority of students accept physics as one of the more difficult lessons in school (Bahrami & Nasab, 2017; Gök & Sılay, 2008; Mattern & Schau, 2002). Interest has been defined as an important variable which positively supports learning processes (Nenniger, 1992; Schiefele, Krapp, & Winteler, 1992). It was also figured out that students' interest towards physics decreases day by day (Gardner, 1999; Haussler & Hoffmann, 2002; Hoffmann, 2002; Jones, Howe, & Rua, 2000; Kahle & Meece, 1994). As a result of this decrease, the students' achievement-related with physics decrease as well.

There are many reasons such as teacher, classroom, teaching environment and teaching tools etc. which decrease the physics achievement of high school students. For example, Redish (1994) stated that many students see physics as a very hard lesson because of including heavy mathematics. Angell, Guttersrud, Henriksen, and Isnes (2004) indicate that many experiments, calculations, graphics and conceptual explanations make physics hard to understand. Also, it is explained that the lack of using the necessary teaching methods and sufficient technology during the education make physics difficult as well (Erdem, Uzal, & Saka, 2018; Halloun & Hestenes, 1985). There are many abstract concepts in physics subjects which make physics hard to understand. Another reason which causes the declining interest in physics is the teaching methods and strategies of teachers in traditional classrooms.

Teachers in traditional the classroom consider that all of the students in classroom have the same intelligence areas, abilities, level of learning and readiness. They teach the subjects only according to verbal and numerical intelligence and they eliminate the other intelligences types their students' have. However, according to the "Multiple Intelligences Theory (MIT)" which was introduced by Howard Gardner in 1983, everyone has different types of intelligences which have various development levels. It has been shown that the achievement of students in the classroom depends on the appropriate usage of the various multiple intelligences they have (Abdi, Laei, & Ahmadyan, 2013; Ghazi, Shahzada, Gilani, Shabbir, & Rashid, 2011; Hanafin, 2014; Kurniawan, Rustaman, Kaniawati, & Hasanah, 2017). The Gardner's MIT includes not only Verbal-linguistic (V-L) and Logical-mathematical (L-M) but also includes Visual-spatial (V-S), Bodily-kinesthetic (B-K), Social-Interpersonal (S-I), Musical-rhythmic (M-R), Intrapersonal-individual (I-I) and naturalist (N) intelligences too. Except for these eight intelligences, there are three candidate intelligences (existential, spiritual and moral) as well (Smith, 2008). This means that students have different types of intelligences so that the teachers can teach with eleven teaching ways.

Thus, teachers should first try to understand their students' level about the topics they want to teach, make a research to know their students' backgrounds and determine their students' intelligences as well. After detailed research about their students, they should reorganize their lessons plans according to their students' personalities, abilities and intelligences, to figure out which teaching strategies are most appropriate for their conceptual development. After this step, teachers should also prepare suitable teaching environments to increase the students' interest toward physics. In this context, they can do many things. For instance, abstract physics subjects might be visualized by using various technologies. Thus, the abstract concepts of physics subjects can be simplified by using educational technologies (Kolçak, Moğol, & Ünsal, 2014). It is shown that using multimedia supported education activities increase students' physics success (Harwood & McMahon, 1997; Kolçak et al., 2014). The dangerous and expensive experiments can be done interactively with animation and simulation applications via the internet by using educational technologies such as computers, projections, lap-tops and tablet computers (Erdem et al., 2018; Fendt, 2004; Kolçak et al., 2014; Şengel, Özden, & Geban, 2002). Therefore, the integration of technology by internet access into the classroom is a very good and beneficial way for simplifying hard physics subjects. In conclusion, it can be stated that teaching physics by using educational technologies is very suitable for teaching physics subjects according to MIT approach. Because teaching according to MIT approach and other new teaching strategies already need the educational technologies used in the classrooms.

Many countries have tried to integrate technology into their education systems in order to have better teaching and learning levels. Thus, the high-budget projects are supported in several countries such as USA, South Korea, Thailand and France (Ingram, Willcutt, & Jordan, 2008; Kim & Jung, 2010; Lesardoises, 2012). For similar aims, the Ministry of National Education (MEB) of Turkey introduced "The Movement of Enhancing Opportunities and Improving Technology Project (FATIH Project)" in

2010. The main goal of this project is to integrate technology into education in Turkish schools. It includes five main components: 1- Setting up fiber internet network, 2- Providing equipment and software substructure, 3- Providing and management of educational e-content, effective, conscious, reliable, 4- Manageable and measurable Information and Communication Technologies(ICT) usage in education, and 5-In-service training of the teachers (Demirer & Dikmen, 2018). This project has existed the opportunities to teachers in Turkey to teach according MIT approaches. Because educational technologies are very important tools for teaching according MIT approaches.

Many studies have been carried out in order to figure out the educational technologies effects on students' learning (Anderson et al., 2004; Derting & Cox, 2008; Koile & Singer, 2006; Yoon & Sneddon, 2011). Also, it was figured out that the usage of different kinds of educational technologies tools such as tablet computers have positive effects on students' learning (Enriquez, 2009; Sneller, 2007). As it is known that interest toward physics lessons is one of main reasons which cause the decrease in students' physics success, it can be assumed that the MIT approaches supported by FATIH Project infrastructure can increase the interest toward physics and other science lessons as well. When the related literature is checked carefully, it can be seen that there are many studies have been carried out to investigate the effect of educational technologies (Anderson et al., 2004; Koile & Singer, 2006; Yoon & Sneddon, 2011) and the MIT approaches (Al-Obaidi, 2016; Al Jaddou, 2018; Canbay, 2006; Erkaçan, Moğol, & Ünsal, 2012; Kalenderoğlu & Zorluoğlu, 2018; Winarti, Ichsan, Listyarini, & Hijriyanti, 2019; Xie & Lın, 2009; Zubi, Al-Rabee, & Al-Jarrah, 2015) on students' achievements, separately. Therefore, this study is carried out to examine the relationship between multiple intelligences applications assisted with FATIH Project, students' multiple intelligences areas and students' physics success.

1.1. Problem of the Research

This research was carried out to examine the relationship between students' multiple intelligences areas, gender, number of siblings and physics success. In accordance with this purpose, the problem of this research is: "Is there any influence of multiple intelligences theory's applications supported with FATIH Project substructure on students' physics success and their multiple intelligences areas development?"

1.2. Sub-problems

1- Does gender have a significant effect on students' multiple intelligences areas development?

2- Does students' sibling number have a significant effect on students' multiple intelligences areas development?

3- Which intelligence groups' physics success can be increased better by the multiple intelligences theory based teaching method supported by the FATIH project infrastructure?

2. METHOD

2.1. Purpose of the Research

This research was carried out to examine the relationship between students' multiple intelligences areas, gender, number of siblings and physics success.

2.2. Research Design

The pretest-posttest quasi experimental model with a control group and the relational scanning model are used. The pretest- posttest control group model which is one of the quasi-experimental is used to investigate the effect of teaching approach based on multiple intelligence theory supported by FATIH project infrastructure on traditional teaching methods. In the pretest and posttest control group model used in this study, there are two groups, one of which is experimental and the other is the control group. Another feature of this model is to take measurements from both selected groups both before and after the applications. The relationship between dependent and independent variables is examined; therefore the relational scanning model among the scanning models is used as well. Scanning models are the research approaches that aim to describe a situation which happened in the past or still exist with its all contents (Çepni, 2010; Karasar, 2013). The relational scanning model is used to determine the

relationships between the variables and to estimate the possible results (Karasar, 2013). Multiple intelligence areas from variables in which the model is created (logical-mathematical intelligence, verbal-linguistic intelligence, social-interpersonal intelligence, bodily-kinesthetic intelligence, musical-rhythmic intelligence, visual-spatial intelligence, intrapersonal-individual intelligence) predicted (dependent) variables, and demographic variables (gender and siblings number) are determined as a predictor (independent) variables.

2.3. Participants

The sample of the study consisted of 200 students (78 males and 122 females) from ninth class of two schools of Yuksekova district of Hakkâri city (Turkey). The research was carried out in academic year of 2017-2018. In the research, the TOKI Anatolian High School and the Semsettin Onay Anatolian High Schools in Yuksekova are chosen as application schools. The data of participants is given in Table 1.

Table1. Gender Distribution of Experimental and Control Groups in Practice Schools

Schools	Groups	Female	Frequency (%)	Male	Frequency (%)
TOKİ Anatolian	**Experimental Group**	26	13.0	24	12.0
	Control Group	36	18.0	14	7.0
Semsettin Onay Anatolian	**Experimental Group**	31	15.5	19	9.5
	Control Group	29	14.5	21	10.5

As it can be seen from Table 1, Female students in the experimental group of TOKI Anatolian High School formed 13%, female students in the control group formed 18%, male students in the experimental group formed 12% and male students in the control group formed 7% of the sample. Female students in the experimental group of Semsettin Onay Anatolian High School constituted 15.5%, female students in the control group constituted 14.5%, male students in the experimental group constituted 9.5% and male students in the control group constituted 10.5% of the sample as well. In addition, gender distribution of the sample groups regardless of school differences is given in Table 2.

Table2. Gender Distribution of Experimental and Control Groups

Groups	Female	Frequency (%)	Male	Frequency (%)	Total
Experimental Group	57	28.5	43	21.5	100
Control Group	65	32.5	35	17.5	100
Total	122	61.0	78	39.0	200

The data of Table 2 shows that regardless of school differences, the sample of the study is formed by 100 students from the experimental group (57 [28.5%] females and 43 [21.5%] males) and 100 students from the control group (65 [32.5%] females and 35[17.5%] males).

2.4. Data Collection Tools

In order to determine the students' intelligences areas; "the Inventory of Multiple Intelligence Areas for Students (Oral, 2006)" is carried to the all students and "the Profile of Multiple Intelligences Areas for Students (Saban, 2004)" is used for determination of data obtained with "the Inventory of Multiple Intelligence Areas for Students".

2.4.1. The Inventory of Multiple Intelligence Areas for Students

"The Inventory of Multiple Intelligence Areas for Students" which was prepared by Oral (2006) is used in order to determine the students' intelligences areas. The validity and reliability of the inventory was measured by the researcher and the reliability of the inventory was found as 0.77 for the 0.05 level of significance. This Likert-type inventory consists of ten sections and a total of eighty items. The items consist of five stages as given below;

"0 =Totally not appropriate to me; 1 = Very little appropriate to me; 2 = Partially appropriate to me; 3 = Quite well appropriate to me; 4 = Totally appropriate to me".

2.4.2. The Profile of Multiple Intelligences Areas for Students

"The Profile of Multiple Intelligences Areas for Students" which was formed by Saban (2004) is used for determination of data obtained with "the Inventory of Multiple Intelligence Areas for Students". For this purpose, the scores of each student from each section of the inventory were collected and the

total scores of students' intelligences areas were determined. According to the results, the total scores of each students were determined as "Highly advanced" if intelligence area's total score is between 32-40; "Advanced" if intelligence area's total score is between 24-31; "Moderately advanced" if intelligence area's total score is between 16-23; "Slightly advanced" if intelligence area's total score is between 8-15 and "Unadvanced" if intelligence area's total score is between 0-7.

2.4.3. The Physics Success Test

A multiple-choice physics success test related with "Newton's Laws of Motion" consisting of 25 questions which had been asked in the university entrance exams was prepared. Success test was applied to 10th grade students who have learned this subject in practice schools and 5 questions have low reliabilities were removed from the test in order to increase the reliability of the success test. In conclusion, a multiple choice physics success test which its reliability and validity is enough consisting of 20 questions was prepared. This success test was applied to the control and experimental groups as a pre-test before teaching of the subjects. "Newton's Laws of Motion" subject was taught to the experimental groups with multiple intelligences theory based teaching method supported by the FATIH project infrastructure. The same subject was taught to the control groups according to the traditional teaching methods. After two weeks of teaching the subjects, the physic success test was applied again to the both groups as a post-test.

2.5. Data Analysis

After the determination of students' intelligences areas according to "The Profile of Multiple Intelligences Areas for Students", "Highly advanced (32-40)" intelligences areas were coded as 4; "Advanced (24-31)" intelligences areas were coded as 3; "Moderately advanced (16-23)" intelligences areas were coded as 2; "Slightly advanced (8-15)" intelligences areas were coded as 1 and "Unadvanced (0-7)" intelligences areas were coded as 0. After doing this determination, for both control and experimental groups, eight intelligences groups were formed from the students whose intelligences areas total score was determined as highly advanced (4) and advanced (3). The whole data obtained from the study was analyzed by using frequency, mean, standard deviation, t-test and Anova. Research data obtained in the research is analyzed with SPSS 22 program.

3. FINDINGS

In this part of the study, the findings related with each sub-problem of the study obtained are given in Tables 3-8 and Figure1.

3.1. Findings Related with First Sub-problem

The first sub-problem of the study was such as: Does gender have a significant effect on students' multiple intelligences areas development? In order to test this sub-problem, the intelligences areas of students who participated to the study were measured and the data obtained is given in Table3.

Table3. The Data Obtained Related with the Students' Multiple Intelligences Areas

Intelligences areas	Gender	N	$\bar{X}$	Std.dev.
Logical-mathematical (L-M)	Male	78	31.29	7.356
	Female	122	25.43	7.276
Verbal- linguistic (V-L)	Male	78	27.09	6.715
	Female	122	28.07	6.740
Visual-spatial (V-S)	Male	78	27.85	6.975
	Female	122	27.66	6.188
Musical-rhythmic (M-R)	Male	78	19.03	6.975
	Female	122	19.84	6.764
Bodily-kinesthetic (B-K)	Male	78	28.81	8.232
	Female	122	24.09	6.733
Social-interpersonal (S-I)	Male	78	30.58	6.008
	Female	122	25.30	7.028
Intrapersonal-individual (I-I)	Male	78	26.38	6.979
	Female	122	27.74	6.147
Naturalist (N)	Male	78	27.26	9.085
	Female	122	25.55	7.226

It can be stated that the sample of the study regardless of gender has all types of intelligences (Table 3). The L-M ($\bar{x}$=31.29**)**, V-S ($\bar{x}$=27.85**)**, B-K ($\bar{x}$=28.81**)**, S-I ($\bar{x}$=30.58**)** and N ($\bar{x}$=27.26**)** intelligences areas of male students are more advanced than of female students while V-L ($\bar{x}$=28.07**)**, M-R ($\bar{x}$=19.84**)** and I-I ($\bar{x}$=27.74**)** of female students are more advanced than of male students. The intelligences areas of both male and female students are compared with each other in order to figured out the gender effect on intelligences areas of students. The intelligences areas of both female and male students are compared by independent samples t-test and obtained results are given in Table 4.

Table4. The Compare Results of T-test Obtained for Intelligences Areas of Male and Female Students

Variable	Gender	N	$\bar{X}$	Std.dev.	t	df	p
L-M	Male	78	31.29	7.356	5.532	198	**.000***
	Female	122	25.43	7.276			
V-L	Male	78	27.09	6.715	-1.000	198	.319
	Female	122	28.07	6.740			
V-S	Male	78	27.85	6.975	.202	198	.840
	Female	122	27.66	6.188			
M-R	Male	78	19.03	6.975	-.816	198	.415
	Female	122	19.84	6.764			
B-K	Male	78	28.81	8.232	4.426	198	**.000***
	Female	122	24.09	6.733			
S-I	Male	78	30.58	6.008	5.479	198	**.000***
	Female	122	25.30	7.028			
I-I	Male	78	26.38	6.979	-1.440	198	.152
	Female	122	27.74	6.147			
N	Male	78	27.26	9.085	1.472	198	.143
	Female	122	25.55	7.226			

(* There is a significant difference at p < .05 level).

When the data given in Table4 is checked carefully, it is seen that male students' intelligences areas of L-M (t=5.532, p=.000<.05), B-K (t=4.426, p=.000<.05), and S-I (t=5.479, p=.000<.05) are significantly advanced than of female students.

3.2. Findings Related with Second Sub-problem

The second sub-problem of the study was such as: "Does students' sibling number have a significant effect on students' multiple intelligences areas development?" In order to respond to this sub-problem, the intelligences areas of students were compared in term of sibling number variable and the data obtained is given in Table5 and Table 6.

Table5. The Data Obtained for the Students' Multiple Intelligences Areas in Term of Sibling Number

Siblings number	N	L-M	V-L	V-S	M-R	B-K	S-I	I-I	N
1	1	21.00	23.00	31.00	16.00	18.00	28.00	35.00	15.00
2	4	29.50	35.50	33.25	25.75	27.25	34.50	32.50	32.50
3	24	27.92	25.04	27.13	17.88	26.17	25.58	24.50	24.79
4	36	28.22	27.58	27.53	20.39	27.08	26.47	26.28	24.81
5	28	29.04	31.11	28.29	18.96	27.36	28.64	27.61	27.29
6	37	26.03	24.51	27.62	19.22	26.08	26.30	28.73	25.84
7	29	28.00	26.69	28.03	20.24	25.14	27.83	27.48	26.31
8	16	29.63	30.69	27.13	20.00	26.38	28.19	26.81	27.00
9	10	27.50	28.10	26.10	19.40	24.50	29.70	28.20	26.80
10	8	25.88	29.88	30.13	20.38	23.00	28.75	28.50	29.50
11	4	21.50	26.00	25.00	15.50	16.50	22.00	23.50	21.50
12	1	31.00	40.00	23.00	16.00	31.00	23.00	23.00	40.00
13	1	31.00	40.00	31.00	23.00	30.00	40.00	23.00	40.00
16	1	27.00	31.00	23.00	15.00	18.00	27.00	31.00	25.00
Total	**200**	27.72	27.68	27.73	19.52	25.93	27.36	27.21	26.21

From the Table6, it is seen that regardless of any variables the lowest advanced intelligence area of the students participated to this research is found as M-R ($\bar{x}$=19.52**)** while the most advanced intelligence area is found as I-I ($\bar{x}$=27.73**).** On the other hand, interesting results were found as well. For example, it can be stated that the lower siblings effects the advancement of L-M, V-L, B-K and Naturalist intelligences areas. Also, it is clear that having siblings more than two effects the advancement of M-R intelligence area. In conclusion, it can be stated that the ideal sibling number is three for the advancement of whole of intelligences areas.

The Anova test was applied to the data given in Table5 in order to figure out the relationship between the intelligences areas advancement and sibling number. The findings obtained for this analyze is given in Table 6.

Table6. The Compare Results of the Anova Test Obtained for Intelligences Areas of Students in Term of Sibling Number.

		Sum of Squares	df	Mean Square	F	p
L-M	**Between groups**	487.202	13	37.477	.595	.857
	Within groups	11719.118	186	63.006		
	Total	12206.320	199			
V-L	**Between groups**	1673.105	13	128.700	3.260	**.000***
	Within groups	7342.050	186	39.73		
	Total	9015.155	199			
V-S	**Between groups**	318.165	13	24.474	.565	.880
	Within groups	8063.255	186	43.351		
	Total	8381.420	199			
M-R	**Between groups**	406.170	13	31.244	.652	.807
	Within groups	8907.750	186	47.891		
	Total	9313.920	199			
B-K	**Between groups**	748.303	13	57.562	.972	.481
	Within groups	11014.717	186	59.219		
	Total	11763.020	199			
S-I	**Between groups**	777.656	13	59.820	1.196	.285
	Within groups	9306.139	186	50.033		
	Total	10083.795	199			
I-I	**Between groups**	602.703	13	46.362	1.105	.357
	Within groups	7806.477	186	41.970		
	Total	8409.180	199			
N	**Between groups**	1011.610	13	77.816	1.227	.263
	Within groups	11800.145	186	63.442		
	Total	12811.755	199			

(* There is a significant difference at p < .05 level).

The Anova analyze results given in Table6 show that there is a significant relationship between sibling number and the advancement of V-L intelligence area (F=3.260; p= .000 <.05). This shows that the higher sibling number increase the advancement of V-L intelligence area.

3.3. Findings Related with Third Sub-problem

The third sub-problem of the study was such as: "Which intelligence groups' physics success can be increased better by the multiple intelligences theory based teaching method supported by the FATIH project infrastructure?" In order to respond to this sub-problem, the eight intelligences groups were formed for both control and experimental groups from the students whose intelligences areas are determined as highly advanced level and advanced level. The physics success test was applied to both groups before teaching the subjects as pretest and after teaching the subjects as posttest. The data obtained for intelligences groups' physics success is given in Table6 and Table7.

Table7. Pretest-posttest Data and Increase Amount of Physics Successes of Each Intelligences Groups of Control Group

Intelligences areas groups	N	Mean		Success Increase
		Pretest	Posttest	
L-M	63	6.16	10.75	4.59
V-L	58	6.16	10.26	4.10
V-S	58	6.24	10.34	4.10
M-R	42	5.81	9.69	3.88
B-K	56	6.05	10.30	4.25
S-I	68	6.22	10.07	3.85
I-I	64	6.06	10.05	3.99
N	52	6.12	10.37	4.25

According to Table 7, the L-M intelligence group of control group was obtained the highest increase in physics success among all intelligences groups (4.59 point). This was followed by the 4.25 point physics success increase in the bodily-kinesthetic and naturalist intelligence. The least success increase was seen in the field of S-I with an increase of 3.85 point.

Tablo8. Pretest-posttest Data and Increase Amount of Physics Successes of Each Intelligences Groups of Experimental Group

Intelligences areas groups	N	Mean		Success Increase
		Pretest	Posttest	
L-M	55	6.35	14.73	8.38
V-L	59	6.32	13.75	7.43
V-S	55	6.47	14.16	7.69
M-R	44	6.52	13.75	7.23
B-K	61	6.30	13.90	7.60
S-I	62	6.34	13.65	7.31
I-I	64	6.13	13.72	7.59
N	51	6.39	13.96	7.57

According to Table 8, the L-M intelligence group of experimental group was obtained the highest increase in physics success among all intelligences groups (8.38 point). This was followed by the 7.69 point physics success increase in the V-S intelligence group while the least success increase was seen for M-R intelligence group with an increase of 7.23 point.

The increase in physics success of both experimental and control groups' intelligences areas groups is given in Figure1.

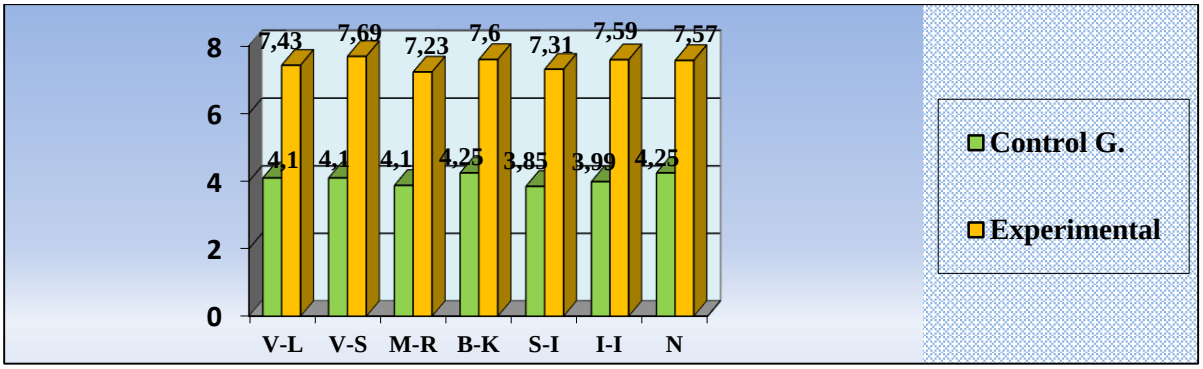

Figure1. Increase in Physics Success of Both Experimental and Control Groups' Intelligences Areas Groups.

As it can be seen from Figure1, all intelligence groups' physics success has been increasingly better by the multiple intelligences theory based teaching method supported by the FATIH project infrastructure compared to traditional teaching methods. The highest increase deference in physics success of students was obtained for L-M intelligence group (3.79 point) and the least increase difference in physics success of students was figured out for N intelligence group (3.32 point). On the other hand, the physics success increase difference was found as 3.60 for I-I intelligence group, 3.59 for V-S intelligence group, 3.46 for S-I intelligence group, 3.35 for M-R intelligence group and 3.35 for B-K intelligence group, respectively.

4. RESULTS AND DISCUSSIONS

There are many factors which affect physics success such as self-efficacy (Güzel & Oral, 2017), human values (Guzel & Oral, 2018) and demographical variables (Güzel & Oral, 2011). This research is carried out in order to figure out the effect of using teaching methods combined the MIT approaches with the FATIH project's substructure on students' physics success.

When the average intelligence areas of the students participated in the study is examined. The sample of the study regardless of gender has all types of intelligences. Also, it is observed that verbal-linguistic(V-L), social-interpersonal(S-I), logical-mathematical(L-M), visual-spatial(V-S), bodily-kinesthetic(B-K), intrapersonal-individual(I-I) and naturalist(N) intelligence levels are improved and the mean of musical-rhythmic(M-R) intelligence is improved at a moderate level. The results obtained here prove that the intelligence has a multidimensional and dynamic structure and the fundamental idea of multiple intelligence theory that all areas of intelligence can be developed (Açıkgöz, 2011). This result is similar to the results obtained from various studies (Aygül, 2015; Azar, 2006; Doğan & Alkış, 2007; Kurt, Çinici, & Demir, 2011). Aygül (2015), in a study conducted with 590 Vocational School students, found that the students' verbal, logical-mathematical, visual-spatial, musical-rhythmic, physical-kinesthetic, intrapersonal-individual and naturalist intelligence levels were high and social intelligence average was moderate. Doğan and Alkış (2007) figured out that the pre-service elementary teachers' naturalist intelligence, verbal-linguistic intelligence and musical-rhythmic intelligence areas were moderately developed and other intelligences areas were developed. In conclusion, both of multiple-intelligences theory based teaching activities supported by FATIH projects and traditional teaching activities can be considered to be effective in the development of the students' intelligence areas in the application schools. However, traditional teaching activities can mostly improve the verbal-linguistic and logical-mathematical intelligences areas. Because in traditional classrooms generally teaching activities are mostly carried out with taking care of these intelligences areas.

The first sub-problem of the study was aimed to figure out the relationship between gender variable with students' multiple intelligence areas developments. The intelligences areas of both female and male students were compared by independent samples t-test (Table 4). According to the data given in Table 4, a significant relationship was found for the L-M, V-S, B-K, S-I and N intelligences areas in term of gender variable in favour of male students, while a significant relationship was found for the V-L, M-R and I-I intelligences areas in term of gender variable in favour of female students. Many pieces of research which investigated the relationship between gender and multiple intelligences have found similar results as well (Güllü & Tekin, 2009; İzci & Sucu, 2014; Serin, 2008). For example, Demir (2010) has found that the M-R and V-S intelligence scores of female students were higher than of male student's M-R and V-S intelligence scores.

According to the findings obtained from the compare result of the intelligences areas of students in term of sibling number variable. It was figured out that M-R intelligences is the lowest advanced intelligence area while I-I is the most advanced intelligence area. The results of this research have shown that the lower sibling number effects the advancement of L-M, V-L, B-K and Naturalist intelligences areas. It can be stated that having siblings more than two effects the advancement of M-R intelligence area. The findings related with second sub-problem have showed that the ideal sibling number is three for the advancement of the whole of intelligences areas as well. On the other hand, the Anova test analyzes results given in Table6 have figured out that a significant relationship between sibling number and the advancement of V-L intelligence area has existed. This shows that the higher sibling number increase the advancement of V-L intelligence area.

The eight intelligences groups' physics success was compared with each other and according to the compare results. The L-M intelligence group of both control and experimental groups have obtained the highest increase in physics success among all intelligences groups. The physics courses are usually processed considering the verbal and numerical intelligence areas. Therefore, it can be stated that the physics successes of logical-mathematical intelligence groups are increased. The other intelligences groups which followed the L-M intelligences group in control groups were the B-K and N intelligence. The students of both groups spend most of their time out of school with grazing animals in the mountains or working in the farms to help their families. Therefore, the physics success increase of the B-K and N intelligence groups in control group followed the L-M intelligence group. Researches on MIT

applications are carried out in Turkey explain the reason for these findings. For example, Özdemir, Güneysu, and Tekkaya (2006) stated that the leading intelligence areas are the L-M, I-I and B-K intelligences, respectively, while the least intelligence area owned by students was the M-R intelligence area. The other highest physics increase was seen for the V-S intelligence group while the least success increase was seen for M-R intelligence group in the experimental group. Yılmaz and Fer (2003) stated that leading intelligence was the visual-spatial intelligence in their research as well. The findings obtained in Figure 1, have shown that all intelligence groups' physics success has been increased significantly better by the multiple intelligences theory based teaching method supported by the FATIH project infrastructure compared to traditional teaching methods. Therefore, this finding indicates that teaching physics with teaching methods combined the MIT approaches with the FATIH project's substructure will be very beneficial.

4.1. Conclusions and Suggestions

Based on the findings of this research, the results of the research can be summarized as below;

1) A significant relationship was found for the L-M, V-S, B-K, S-I and N intelligences areas in term of gender variable in favour of male students.
2) A significant relationship was found for the V-L, M-R and I-I intelligences areas in term of gender variable in favour of female students.
3) The lower siblings effect the advancement of L-M, V-L, B-K and Naturalist intelligences areas.
4) According to the findings of this research, the ideal sibling number is determined as three for the advancement of the whole of intelligences areas.
5) The L-M intelligence group of both control and experimental groups have obtained the highest increase in physics success among all intelligences groups.
6) All intelligence groups' physics success has been increased significantly better by the multiple intelligences theory based teaching method supported by the FATIH project infrastructure compared to traditional teaching methods.

In conclusion, all physics teachers should diversify their teaching ways acknowledging that the only way of teaching physics can't be through only Verbal-linguistic and Logical-mathematical ways. They should also take care of the other types of intelligences as well. Using different activities paying attention to different types of intelligences can increase students' motivation towards the physics courses. When students' motivation and interest increase, more effective instruction can be expected.

However, not only the teachers but also the program makers, administrators and even the parents should be informed about applications of MI-based instructional techniques supported with FATİH project's sub-structure. Therefore, the findings of this research can be viewed as an impetus for implementing MI-based activities in a content-based framework for reaching all learners with diverse profiles in the classroom and achieving a more effective instruction besides improving students' attitudes towards physics courses.

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