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## The Relation Between Elementary School Students' Science Success and Science Attitude, Anxiety, Interest<sup>1</sup>

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### Abstract

Science course for students is the first step in science for them. This study has been done to find out the relation between students' success in science lessons and interest, attitude and anxiety towards the science. The correlational survey method was used in this research. The universe of the study is the 4th grade students attending to the elementary schools in Amasya City in 2016-2017 academic year and the sample consists of 211 students. The Unit Light and Sound Achievement Test, The Scale of Interest Towards Science, The Scale of Anxiety Towards Science, The Scale of Attitude Towards Science and the personal information form are the data collecting tools. The data was analysed in the SPSS 20.0 programme. It has been found out in the analyses the students' success, attitudes and interests are over average, their anxiety is low. No meaningful difference in terms of gender has been found out in the student achievement, attitude, anxiety and the interest. It has been concluded that decreasing students' anxiety towards the science will increase their attitude and achievements. Regression equation was developed for the study. The class teachers are suggested that enlarging the students' field of interest by applying different activities during science course can change their anxiety and attitude towards science.

**Keywords:** Science succes, science attitude, science anxiety, science interest.

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## **Introduction**

Science course is an important lesson in almost each level of education. Among the aims of science education are to bring up science literate individuals, to assist in the selection of professions, and to provide positive attitudes and values towards science (Ministry of National Education, 2005). It is well known that both the cognitive and the affective properties in education influence success and that they are variables in the learning environment. In the classroom environment, there are variables that can be directly intervened such as method-technique etc. as well as the ones that cannot be directly intervened such as attitude, perception and anxiety. Developing positive attitudes toward science motivates students to pursue a career in science education and science. There are factors affecting attitudes towards science such as teachers, family, peer group, gender, motivation for success, and anxieties about science activities and science itself (George, 2006).

Attitude is defined as "an emotional preparation or tendency in the form of an individual's acceptance or rejection of a particular person, group, institution, or thought". Attitudes arise from beliefs about the object which is the subject of the attitude. Attitude is not a visible behavior, but a tendency to prepare behavior (Kağıtçıbaşı, 1999). When definitions of interest and attitude are compared, it is interesting to note that interest is a nonobligatory self-attitude towards the person, object or activities. It is based on preferences, and it consists of activities which the person is content with and focuses on. Yet, attitude has a lot of determinants. And the environment, culture, experiences and prejudices of the person affect his/her attitude. Research shows that there is an important relationship between students having positive attitudes towards science lessons and their success in science (Koballa, 1988).

One of the determinants of the success in lessons is the learner's interest in the lesson content. Roe (1964) defines interest as "*something that a person looks at, observes, thinks over and enjoys without making any special effort*" (qtd: Özgüven, 1994). Interest is an important feature and influencing factor in school life as well (Harty& Beall,1984). Students become more successful in lessons, learn faster, and keep the learned things for longer time if they are interested in. According to Koran and Longino (1982)'s research, interested young people are more successful than those with low interest because they are searching for events and objects for a longer time and reason much more. In addition to this, interested young people remember their experiences, understand, and learn more complex concepts better.

It is known that besides the cognitive and affective properties that affect learning, anxiety is also important (Laukenmann, Bileicher, Fu, Glaser-Zikuda, Mayring&Rhöneck, 2003). Atabek (2000) defines anxiety which affects the life of an individual in a negative way as: "*to scare as if there is an objective threat.*" Anxiety generally arises when a system or concept is misunderstood or malfunctioning (Connolly, Murphy & Moore, 2009). Anxiety is a condition in which many factors interact. These are lessons, topics and publications related to education and curriculum, family attitudes, values and expectations from lessons (Lazarus, 1974), social support, academic success, family relationships, perfectionism, work skills, focus of supervision (Yıldırım et al, 2008), teacher's characteristics and teaching methods (Daniels, 1983) as well.

It is important to identify and control the emotional characteristics that affect students' success. Science can be difficult lesson for children and so they may fail in exams like PISA held around the world. In this respect, efforts to reveal the influence of affective factors such as attitude, anxiety and interest are important as success indicators. Within the formal education in Turkey, the students experience science lessons at the 1st grade of elementary school for the first time. According to current curriculum, science lessons begin in the 3<sup>rd</sup> grade in primary school. Attitudes of the students towards the science are beginning to take shape considerably in this process. The purpose of this research is to determine the relationship between the successes of the 4<sup>th</sup> grade students in science lessons in primary school and the interest, attitude and anxiety.

## **Research Problem**

What is the relationship between the attitudes, anxieties and interests of primary school students and their success in science lessons? Sub problems are below:

1. How do the students' successes in science lesson, their attitudes towards the science and the anxieties and interests about the science change?
2. How are the attitudes, anxieties and changes of interests of the students in relation to successes in science lessons according to their gender?
3. What is the effect of children's parental educational levels on the successes, attitudes, anxieties and the interests in the science lesson?
4. What is the effect of students' having a computer on the successes, attitudes, anxieties and the interests in the science lesson?
5. What is the effect of students' following the science related publications on the successes, attitudes, anxieties and the interests in the science lesson?
6. Is there a relationship between students' successes, attitudes, anxieties and interests?

### **Research Assumptions**

Science success test belongs to "Light and Sound" unit. It is assumed that the success of this test corresponds to the successes in the science lesson in general. It is assumed that the students answer the test and scales sincerely and correctly.

### **Research Limitations**

The study is limited to a total of 211 students in the 4<sup>th</sup> grade in a primary school in the province of Amasya in 2016-2017 education year.

## **METHOD**

### **Research Model**

Correlational survey method was used in this research. Correlational survey model is a research aiming to determine the views, interests, skills, abilities, attitudes etc. of the participants and generally based on larger samples compared to other researches (Çepni, 2010).

### **Research Sample**

The universe of the study is the 4<sup>th</sup> grade students attending to the elementary schools in Amasya City in 2016-2017 academic year and the sample consists of 211 students. Sample selection method is purposeful sample selection method. According to purposeful sample selection method, the fact that the 4<sup>th</sup> grade students have learned "Light and Sound" unit in science class is selected as criterion. 211 students participated in the research, and 106 of them are female students while 105 of them are male students. The demographic characteristics of the students are specified in Table 1.

**Table 1.** Demographic properties of research sample

		n	%
Gender	Female	106	50,2
	Male	105	49,8
Mother's educational background	Unanswered	11	5,2
	Elementary school	57	27,0
	Secondary school	39	18,5
	High school	50	23,7
	University	42	19,9
	Master	12	5,7
Father's educational background	Unanswered	13	6,2
	Elementary school	22	10,4
	Secondary school	34	16,1
	High school	63	29,9
	University	59	28,0
	Master	20	9,5

Have you got a computer?	Unanswered	9	4,3
	Yes	135	64,0
	No	67	31,8
Do you read the publications related to science?	Unanswered	14	6,6
	Yes	97	46,0
	No	100	47,4

### Data Collecting Tools

A questionnaire is prepared to collect data. Demographic characteristics are included in first part, and then, scales and success tests below are included.

**Science Light and Sound Success Test:** “Light and Sound unit Success Test” developed by İlhan (2014) is a multiple choice test consisting of 30 questions. The items in assessment instrument were prepared at the level of knowledge, comprehension and application, the reliability was calculated as 0,83 according to the test analysis.

**Science Attitude Scale:** It is 5 point likert scale, consisting of 15 items, developed by Geban, Ertepinar, Yılmaz, Atlana and Şahbaz (1994). It was formed as “Strongly Agree”, “Agree”, “Undecided”, “Disagree” ve “Strongly Disagree”. It was calculated by Başer (1996) and the internal consistency factor was determined as  $\alpha=0,83$ .

**Science Anxiety Scale:** It is a 5 point likert scale, consisting of 28 items, developed by Doğru and Güzeller (2011). The positive items for anxiety were marked from 1 to 5 points from “Strongly Disagree” to “Strongly Agree”; and negative items for anxiety were marked from 5 points to 1 point. Cronbach alpha internal consistency reliability factor of the scale was 0,96.

**Science Interest Scale:** It is a 5 point likert scale, consisting of 28 items, developed by Laçın Şimşek ve Nuhoglu (2009). Interest scale is a scale developed to assess the interest of the individuals in science. Cronbach Alpha reliability factor of the scale consisting of 27 items, 21 positive and 6 negative items, was determined as  $\alpha=0,79$ .

### Analyses of Data

Analysis of data was performed by using SPSS 20.0. In descriptive analysis percentage and frequency statistics were used. After checking whether the data has a normal distribution or not via Kolmogorov-Smirnov test, analyses were made with nonparametric tests. Mann Whitney U test was performed in the comparison of binary groups, Kruskal Wallis H test for more than two and Spearman Brown test was performed for the correlation. The results were determined at the  $p=0,05$  significance level.

## FINDINGS

The descriptive analysis of the responses of the sample to Science success test (SST) attitude scale (SAS), interest scale (SIS) and anxiety scale (SAnS) was specified in Table 2.

**Table 2.** Descriptive statistics of total test scores

	N	Min	Max	$\bar{X}$	s
SST	211	4	30	20,43	5,55
SAS	211	0	75	65,18	11,03
SAnS	211	0	123	43,57	19,63
SIS	211	0	135	112,18	20,09

The arithmetic average of the 211 students who participated in the research was calculated as 20,43; attitude scale arithmetic average was calculated as 65,18; and interest scale arithmetic average was calculated as 112,18 while anxiety scale was calculated as 43,57 according to the Table 2. The successes, attitudes and interests of the students are above the midpoint and the anxiety rates are below.

The differences in the total score of the students according to their gender were analyzed via Man Whitney U test and the results were specified in Table 3.

**Table 3.** Results of U test according to gender

	Gender	N	Mean of Ranks	Sum of Ranks	U	p
SST	Female	106	106,28	11266,00	5532,00	0,946
	Male	105	105,71	11100,00		
	Total	211				
SAS	Female	106	108,33	11483,50	5317,50	0,576
	Male	105	103,64	10882,50		
	Total	211				
SAnS	Female	106	100,10	10611,00	4940,00	0,157
	Male	105	111,95	11755,00		
	Total	211				
SIS	Female	106	107,29	11372,50	5428,50	0,758
	Male	105	104,70	10993,50		
	Total	211				

It is seen that there is not a significant difference when students averages were compared according to their gender in Table 3 ( $p > 0,05$ ).

The comparison of the students' total scores according to their mother's educational background was made via Kruskal Wallis H (K-W test). The results were specified in Table 4.

**Table 4.** Results of K-W test for comparison of the students' total scores according to their mother's educational background

		N	Means of Ranks	df	X <sup>2</sup>	p	Source of Significance
SST	1-Elementary sc	57	80,33	4	16,24	0,003	1-3
	2- Secondarysc	39	99,09				
	3- High school	50	105,44				
	4- University	42	126,44				
	5- Master	12	89,50				
	Total	200					
SAS	1-Elementary sc	57	93,42	4	4,79	0,310	
	2- Secondarysc	39	108,95				
	3- High school	50	106,47				
	4- University	42	102,68				
	5- Master	12	74,17				
	Total	200					
SAnS	1-Elementary s.	57	107,83	4	3,95	0,412	
	2- Secondary s.	39	96,82				
	3- High school	50	100,93				
	4- University	42	88,54				
	5- Master	12	117,71				
	Total	200					
SIS	1-Elementary s.	57	91,35	4	8,34	0,08	
	2- Secondary s.	39	107,46				
	3- High school	50	106,14				
	4- University	42	110,11				
	5- Master	12	64,21				
	Total	200					

The significant difference was determined in only success test when their total scores are compared according to their mothers' educational background ( $X^2=16,24$   $p < 0,05$ ). A significant difference was determined among the successes of the students whose mothers graduated from elementary school and

high school, and elementary school and university according to their educational background. In the science attitude, science anxiety and science interest, a significant differences weren't determined according to mother's educational background of participant students.

The K-W test results of the comparison of the students' total scores according to their father's educational background were specified in Table 5.

**Table 5.** Results of K-W test for the comparison of the students' total scores according to their father's educational background

		N	Means of Ranks	df	X <sup>2</sup>	p	Source of Significance
SST	1-Elementary s.	22	95,11	4	13,89	0,008	1-4
	2- Secondary s.	34	88,49				2-4
	3- High school	63	85,39				3-4
	4- University	59	121,32				
	5- Master	20	103,13				
	Total	198					
SAS	1-Elementary s.	22	86,91	4	3,81	0,432	
	2- Secondary s.	34	97,62				
	3- High school	63	110,07				
	4- University	59	96,78				
	5- Master	20	91,28				
	Total	198					
SAnS	1-Elementary s.	22	97,43	4	6,71	0,152	
	2- Secondary s.	34	107,28				
	3- High school	63	87,48				
	4- University	59	100,85				
	5- Master	20	122,45				
	Total	198					
SIS	1-Elementary s.	22	83,16	4	10,11	0,039	1-3
	2- Secondary s.	34	93,22				3-5
	3- High school	63	113,60				4-5
	4- University	59	102,73				
	5- Master	20	74,20				
	Total	198					

When the total scores of the students were compared according to their father's educational background, significant differences were determined in success and interest. The significant differences were determined in the success tests of the students whose fathers graduated from elementary school and university, secondary school and university, high school and university ( $X^2=13,89$   $p<0,05$ ). In the science attitude and anxiety attitude, a significant difference was not determined according to their father's background. In interest scale, significant difference was determined between the students whose fathers graduated from elementary school and high school, high school and master, university and master ( $X^2=10,11$   $p<0,05$ ).

The total scores were compared according to the fact whether they have computers at their home or not, and the results were specified in the Table 6.

**Table 6.** Results of U test according to the fact whether they have computers at their home or not

		N	Mean of Ranks	Sum of Ranks	U	p
SST	Yes	135	104,21	14068,00	4157,00	0,349
	No	67	96,04	6435,00		
	Total	202				
SAS	Yes	135	103,77	14009,50	4215,50	0,431
	No	67	96,92	6493,50		
	Total	202				
SAnS	Yes	135	98,39	13283,00	4103,00	0,282
	No	67	107,76	7220,00		
	Total	202				
SIS	Yes	135	101,42	13692,00	4512,00	0,979
	No	67	101,66	6811,00		
	Total	202				

When students' scores were compared according to the fact whether they have computers at their home or not, significant difference was determined ( $p > 0,05$ ). The science success arithmetic average (20,71) of the students who have computer was higher than the students who do not have (19,97), while the difference was not significant statistically.

The comparison of the total scores of the participating students who read the publications relating to the science and the ones who do not read was specified in Table 7.

**Table 7.** Results of U test according to participants who read publications relating to the science

		N	Mean of Ranks	Sum of Ranks	U	p
SST	Yes	97	106,51	10331,00	4122,00	0,068
	No	100	91,72	9172,00		
	Total	197				
SAS	Yes	97	108,93	10566,50	3886,50	0,016
	No	100	89,37	8936,50		
	Total	211				
SAnS	Yes	97	84,96	8241,00	3488,00	0,001
	No	100	112,62	11262,00		
	Total	211				
SIS	Yes	97	115,84	11236,00	3217,00	0,000
	No	100	82,67	8267,00		
	Total	211				

According to the comparison, a significant difference was not determined in the success test's total scores. While the attitudes and interests mean rate of the students who read the publications related to science was higher and the difference was significant, the anxiety related to science was lower and the difference was significant ( $p < 0,05$ ).

The relationships among the SST, SAS, SIS, SAnS were determined according to the Spearman Brown correlation analysis. The results were specified in Table 8.

**Table 8.** Results of correlation analysis for total scores

		SST	SAS	SAnS	SIS
SST	r	1	0,133	-0,243**	0,162
	p		0,054	0,000	0,019
	N		211	211	211
SAS	r		1	-0,346**	0,526**
	p			0,000	0,000
	N			211	211
SAnS	r			1	-0,498**
	p				0,000
	N				211

There is not a significant relationship between the science success and the attitudes of the students toward Science ( $p > 0,05$ ). There is a significant relationship in negative direction at a low level between the anxiety relating to Science and the success ( $r = -0,243$ ;  $p < 0,05$ ). There is a significant relationship in positive direction at a low level between the Science success and their interests relating to Science ( $r = 0,162$ ;  $p < 0,05$ ). There is a significant relation in negative direction at medium-level between attitudes toward Science and the anxiety ( $r = -0,346$ ;  $p < 0,05$ ). There is a significant difference in negative direction at a low level between Science anxieties and interests of the students ( $r = -0,498$ ;  $p < 0,05$ ).

Regression analysis was conducted to determine the effects of science attitude, science anxiety, interest in science, mothers' and fathers' educational backgrounds on science achievement. Regression results were given in Table 9.

**Table 9.** Regression analysis results on the prediction of science achievement

Variable	B	Std. Error	$\beta$	t	p	Duo r	Partial R
Constant	20,219	3,419		5,913	0,000		
SAS	0,040	0,036	0,079	1,109	0,269	0,143	0,077
SAnS	-0,071	0,022	-0,250	-3,269	0,001	-0,265	-0,223
SIS	-0,005	0,021	-0,016	-0,210	0,834	0,128	-0,015
MotherEB	0,622	0,349	0,152	1,781	0,076	0,142	0,123
Father EB	-0,113	0,360	-0,027	-0,314	0,754	0,050	-0,022

There is an intermediate level significant relationship between students' achievements and SAS, SAnS, SIS, parents educational background ( $R = 0,309$   $R^2 = 0,096$   $F_{5-205} = 4,333$   $p = 0,001$ ). These variables explain the 10 % of the variance success. Depending on the standardized regression coefficient ( $\beta$ ), the importance sequence of interpreting variables on success are anxiety, attitude and interest. It can be said that anxiety variable has a meaningful interpreting on success according to the t-test results with regression coefficient. The other variables have no effect on success. Developed regression equation is below.

$$SST = 20,219 + 0,040SAS - 0,071SAnS - 0,005SIS + 0,622 \text{ MotherEB} - 0,113\text{FatherEB}$$

### DISCUSSION AND CONSLUSION

In the research, the success of students, the interests and attitudes toward Science was determined to be higher than the medium level and anxiety was low. It is seen that there is not any significant difference in these variables according to the gender. It can be expressed that the educational background of the mothers and fathers of the students is an effective factor in the success of students in Science. The children of the mothers and fathers who graduated from high school and university are more successful than the others. The educational background of the fathers is an effective factor in their interest relating to Science. Having a computer does not have a significant effect in terms of these variables. Reading the publications related to Science caused a significant difference in the total scores of attitude, interest and anxiety. While relationship between the success in Science and attitude was not significant, there was negative relationship between success in Science and anxiety, and there was



a positive relationship between success in Science and interest at a low level. It was determined that there was a negative relationship between anxiety and attitude toward Science, and there was a positive relationship between interest and attitude toward Science at a medium level and there was a significant relationship between anxiety and interest in negative direction at a medium level.

One of the most effective factors in increasing the success in Science class is the attitudes and interests. Also the anxieties related to this lesson are other important factors in success. According to the researches, the interests, the experiences and families' interest of the students in Science are the factors affecting the student's attitudes toward Science and Technology class (Laçın Şimşek & Nuhoğlu 2009). The researches done in Science reveal that the success and attitude are related. The students who have a high attitude in Science are successful (Altınok, 2005; Balım, Sucuoğlu & Aydın, 2009; Yalvaç & Sungur, 2000); and it is indicated that this condition affects the developing scientific attitudes and interesting (Dieck, 1997; Martinez, 2002) in Science. In the research done by Özyalçın Oskay, Erdem and Yılmaz (2009) in chemistry laboratory lesson, a relationship between the attitude toward chemistry lesson and success at a low level was determined. In the same research, when they examined the attitude according to the gender, a significant difference was determined in favor of girls. They bear resemblance to the findings in Salta and Tzougraki (2004) researches.

Generally anxiety and success affect each other negatively. Also in this research, a negative relationship was determined between Science anxiety and success. It was observed that the students who have a lower Science anxiety are more successful in Science lesson and the students who have a higher anxiety are not successful like others (Doğru & Güzeller, 2012). Uluçınar Sağır (2012) specified that the gender does not result in a significant difference in Science attitude and anxiety of primary education students; the anxiety increases while the grade level increases. Gömleksiz and Yüksel's (2003) research on 4th and 5th grade primary education students, it was determined that they have anxieties including failing in Science and are interested in class.

In the researches done by Yaman and Öner (2006) it was seen that primary education students have high attitudes and interests in Science. There are similar findings in literature (Durmaz & Özyıldırım, 2005; Eke, 2010). Güven Yıldırım and Köklükaya (2016) found that the primary and secondary education students' interests in Science are high and there is a significant difference in favor of level of grade and male students. Laçın Şimşek (2007) indicates that the students' interests in biology topics are higher. These results are similar to the present research findings.

In this research, it was determined that the educational background of mothers and fathers leads to significant difference in the student's success and interests. As parents' educational level increases, the amount of the attention they pay and the opportunities they provide for their children's education increase. Thus, it is expected that the students who have scientific publications and their own computers and the students whose parents are interested in their children's education can be more successful. In Sarier's (2016) metaanalysis research it was specified that the effect size of the factors related to family is 0,271 and this is important. In assessment study of PISA 2006, Anıl (2009) found a positive relationship between parents' educational background and cultural richness, and students' success. There are studies that reveal the families' social economic level have an effect on the students' success (Arıcı, 2007; Kocaman, 2008; Özer ve Anıl, 2011; Polat, 2009; Wang, 2004 ).

The success test applied on the students in there search was about light and sound unit. It was seen that attitude, anxiety and interest were no effect on success related to the regression equality. These variables together explain 10% on success. Anxiety towards science was meaningful.

## **SUGGESTIONS**

The attitudes of students toward Science can be developed by using different methods and techniques in application of Science lessons. Participating in different activities and examining the applications of sciences in the daily life will also improve the students' interest in Science. The students whose science attitudes and interests increase will experience less anxiety in the science lesson. On the condition that the attitudes of the class teachers who teach Science in primary education improve, the changes in the emotional behaviors of the students can be controlled. A teacher, who does not love the lesson, undoubtedly can not be a good model for the students in terms of attitude and motivation. Students can also make this kind of practices and activities at different levels.

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