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## ELEMENTARY SCHOOL PUPILS' SELF EFFICACY TOWARDS SCIENCE AND TECHNOLOGY LESSON

**Esra Uçak,  
Hüseyin Bağ**

### Introduction

Self-efficacy is a crucial concept in Bandura's social learning theory. The first time Bandura mentioned about this concept was in 1977 in "Self Efficacy: Toward a Unifying Theory of Behavioral Change". The preliminary studies in this area were about psychology, medicine and sports. The concept of self-efficacy has been examined in many different fields from developmental psychology to science education, from maths to computer, in relation with a number of variables by Bandura since it began to be debated in 1977 (Demirel, 2009). Bandura (1977) describes self-efficacy as a belief in one's own capability to organize and execute the courses of action needed to manage prospective situations. It is supposed that self-efficacy contribute to (a) the types of goals a person sets for themselves, (b) how much effort a person will expend in performing a task, (c) how long a person will persevere in the face of difficulties, and (d) how resilient the individual will be to failures (Bandura, 1993, Eccles & Wigfield, 2002).

Bloom (1974) postulated that the beliefs students have regarded themselves and their abilities may be the most important variable in the educational process of learning. Pajares (2003) believes self-efficacy to be a students' confidence in their academic abilities. Galpin, V. C., I. Sanders, H. Turner & B. Venter (2003) define the self-efficacy as the abilities which the individual believes to have in order to accomplish his/her tasks. Kinzie, Delcourt & Powers (1994) define self-efficacy as the effort and the permanency of assigned task and self-confidence in the ability to develop the desired attitude of an individual.

Self-efficacy is related to goal orientation independent of ability (Lock & Latham 1990; Mitchell, T. R., Hopper, H., Daniels, D., George-Flavy, J., & James, L. R., 1994). A substantial body of research has shown that people with mastery goals have higher self-efficacy and better task performance than people with performance goals (Locke, E. A., Frederick, E., Lee, C., & Bobko, P., 1984; Wood, R. E., Bandura, A., & Bailey, T., 1990). The link between performance goals and self-efficacy is less clear, with some research citing a positive

**Abstract.** *This study is aimed at determining the 6th, 7th, 8th grade pupils' level of self-efficacy towards Science and Technology lesson and also determining the levels of its sub-dimensions including confidence in Science and Technology lesson, the ability to cope with the difficulties in Science and Technology and the confidence in performing Science and Technology tasks. This study investigates whether there is a meaningful difference in elementary school pupils' self-efficacy of Science and Technology and its sub-dimensions regarding variables such as gender, grade level, and the level of parents' education, reading scientific books and watching scientific documentaries. With this aim, in this study "Personal Information Form" and "Science and Technology Lesson Self-Efficacy Scale" have been used. The sample of this study consists of 705 pupils. As a result of the study, it has been concluded that the elementary school pupils' self-efficacy of Science and Technology and its sub-dimensions are at a high level (=agree level). In addition, while the elementary school pupils' self-efficacy towards Science and Technology lesson differ in terms of grade, level of parents' education and profession, reading scientific books and watching scientific documentaries variables, there hasn't been found a meaningful difference for the gender variable.*

**Key words:** *elementary school pupils, science and technology, self-efficacy.*

**Esra Uçak, Hüseyin Bağ**  
*University of Pamukkale, Turkey*



relationship between performance goals and self-efficacy (Ford, J. K., Smith, E. M., Weissbein, D. A., Gully, S. M., & Salas, E., 1998) and other research reporting a negative relationship between performance goals and self-efficacy (Phillips & Gully 1997). There seems to be some consensus about a negative relationship between performance avoidance and self-efficacy (Middleton & Midgley 1997). Although related to the concept of self-confidence, self-efficacy is distinguished from self-confidence in that the former is task specific. For example, a student may be confident in his/her ability to undertake tertiary study generally, but may have low self-efficacy about undertaking a particular practical class in the science laboratory.

Self-efficacy helps increase the motivation of individuals and contributes to determining goals in relation with their previous success. There are many evidences proving that the students, who say that they have a higher self-efficacy level, use more influential strategies, determine more difficult goals and have higher motivation. Self-efficacy has appeared to be influential on the students' determining and achieving goals (Edmonds, 2002). The students who have higher self-efficacy spend more energy and more are patient when compared with those having suspicions of their abilities on encountering with difficulties (Schunk, 1990). Individuals with higher self-efficacy might be more relaxed and efficient when they face higher levels of difficulty. However, the tasks might seem more difficult than actually they are for those with lower self-efficacy level. While such thinking increases the anxiety and stress, it narrows down the necessary perspective to solve a problem (Pajares, 2002).

Science is often perceived to be difficult compared with other subjects such as the humanities. Yet, surprisingly studies of student science self-efficacy (perception of ability to undertake science tasks) are sparse. Since 2004, in our country, radical changes have been made in the content of the curriculum. When the renewed elementary school curriculum has been examined, beginning with the content, the name and the course hours of science lesson, there have been a great number of radical changes (Tatar, N., Yıldız, E., Akpınar, E. & Ergin, Ö, 2009). Technological features have been added to "Science Lesson" and the name of the lesson has been changed into "Science and Technology". In Çetin's view (2007), using the activities which will contribute to the process of research, examination, problem solution and decision and applying them successfully have been taken as the basis of the Science and Technology curriculum. Pupils' self efficacy toward Science and Technology lesson has a great influence on managing all these.

When the studies about the self-efficacy in Turkey are examined, it is clear that these studies mainly focus on maths self-efficacy, physics self-efficacy, computer self-efficacy, and teacher self-efficacy. When the national and international literature are examined, it appears that the self-efficacy studies are about teachers (Önen & Öztuna, 2005; Bıkmaz, 2004; Gömleksiz, M. N., Kan, A. Ü. & Biçer, S., 2010; Bursal, M., 2010), pre-service teachers (Özkan, Tekkaya & Çakıroğlu, 2002; Morrell & Carrol, 2003; Altunçekiç, Yaman & Koray, 2005; Hamurcu, 2006; Akbaş & Çelikkaleli, 2006, Karaduman & Emrahoğlu, 2011, Laa & Watters, 1995; Ramey-Gassert, Shroyer & Staver, 1996), high school students (Tippins, 1991; Miller, M. D., 2006) and middle school pupils (Kiran & Sungur, 2011).

### *Purpose*

This study aims at determining the 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> grade pupils' self-efficacy towards Science and Technology and also determining its sub-dimensions in relation with some variables. For that purpose, the subproblems of the research are as following:

1. What are the levels of the elementary school pupils' self-efficacy towards Science and Technology lesson and also its sub-dimensions including confidence in Science and Technology lesson, the ability to cope with the difficulties in Science and Technology and the confidence in performing Science and Technology tasks?
2. Does the elementary school pupils' self-efficacy of Science and Technology and its sub-dimensions including "confidence in Science and Technology lesson", "the ability to cope with the difficulties in Science and Technology" and the "confidence in performing Science and Technology tasks" differ in terms of the variables such as gender, grade level, the level of parents' education and profession, reading scientific books and watching scientific documentaries?



## Methodology of Research

### *Research Model*

A general scanning model was used in this descriptive research study.

### *Participants*

The population of research includes total 26502 pupils studying at 6<sup>th</sup> grade (n=8472), 7<sup>th</sup> grade (n=9774) and 8<sup>th</sup> grade (n=8656) at state elementary schools in Denizli city centre in the fall term semester of 2011-2012 academic year.

In order to determine the sample for the population the table, developed by Krejcie & Morgan (1970) has been used. According to this table the minimum number of students that should take place in the sample is 385. However, by exceeding this number a lot more pupils have taken part in this study.

The population of research includes, randomly chosen through sample method, total 705 pupils studying at 6<sup>th</sup> grade, 7<sup>th</sup> grade and 8<sup>th</sup> grade at state elementary schools in Denizli city centre (in Turkey). The demographic characteristics of pupils taking place in the sample have been given in Table 1.

**Table 1. The demographic characteristics for the pupils.**

Variables		N (Frequency)	% (Percentage)
Gender	Girl	370	52.5
	Boy	335	47.5
Grade	6th grade	210	29.8
	7th grade	226	32.1
	8th grade	269	38.2
Mother's education level	Elementary school graduate	249	35.3
	Elementary school graduate	113	16.0
	High school graduate	188	26.7
	College graduate	155	22.0
Father's educational level	Elementary school graduate	157	22.3
	Elementary school graduate	105	14.9
	High school graduate	217	30.8
	College graduate	226	32.1
Mother's profession	Housewife	431	61.1
	Worker	88	12.5
	Self-employed	34	4.8
	Civil servant	152	21.6
Father's profession	Worker	246	34.9
	Self-employed	218	30.9
	Civil servant	241	34.2
Reading scientific books	Read	442	62.7
	Do not read	263	37.3
Watching scientific documentaries	Watch	506	71.8
	Do not watch	199	28.2
Total		705	100



### Data Collection Tools

The data of the research have been collected through "The Personal Information Form" and "Science and Technology Lesson Self-Efficacy Scale".

*The Personal Information Form:* In the personal information form prepared by researchers; the questions in relation with the demographical characteristics such as gender, grade, and parents' education level, parents' profession, reading scientific books and watching scientific documentaries have taken part.

*Science and Technology Lesson Self-Efficacy Scale:* This scale has been developed by Tatar and et al. (2009). The scale is a five point Likert scale and it has 27 items. The reliability and validity studies of the scale have been conducted with the 400 students studying at the 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade of 10 elementary schools. Science and Technology lesson self-efficacy scale is consisted of three factors structure. These three factors are named as "The confidence in the Science and Technology lesson", "coping with the difficulties in the Science and Technology" and "the confidence in performing Science and Technology tasks". These factors are utilized in the literature of naming scale developed by researchers (Chen, G., Casper, W. J., & Cortina, J. M., 2001; Mangos & Steele-Johnson, 2001; Britner & Pajares, 2006). The coefficient of the internal consistency are respectively 0.93, 0.75 and 0.80. The Cronbach alpha coefficient of the general scale is 0.93. Scale description and sample test items are reported in Table 2.

**Table 2. Scale, description and sample test items from the scale.**

Scale	Description	Sample Item
Confidence in science and technology ability	Extent to which student has confidence in science technology ability.	I am sure that I can accomplish all skills given in a Science and Technology lesson successfully.
Coping with difficulties in science and technology	Extent to which student copes with difficulties in science and technology.	I am not sure that I can understand difficult scientific and technological concepts.
Confidence in performing science and technology tasks	Extent to which student has confidence in performing science and technology tasks.	If scientific activities are hard. I give up or I only accomplish parts that are easier.

As a five degree scale was used, the interval coefficients were calculated for four intervals (5-1=4) in the five degree scale like below:

$$(4/5=0.80)$$

I never agree = 1.00-1.80

I don't agree = 1.81-2.60

I am indecisive= 2.61-3.40

I agree = 3.40-4.20

I agree completely= 4.21-5.00

The pupils' means of self-efficacy toward Science and Technology lesson have been interpreted in accordance with the criteria above.

### Data Analysis

The data collected with the scale was inputted into the computer according the codes that were given the each question on the scale. When process of inputting the data was finished, the data was processed and analyzed. In the analysis of the data, SPSS 15 package programme was used. By means



of this programme, the arithmetic mean and standard deviation of the pupils' points that have been obtained from their answers to this scale were determined. In addition to this, t-test and One-way ANOVA have been used for the analysis of the data. The level of meaningfulness was accepted as 0.05.

### Results of Research

The obtained findings and comments about the research have been given in accordance with the subproblems as follows:

#### The Findings of the First Subproblem

The findings about the "What are the levels of the elementary school pupils' self-efficacy towards Science and Technology lesson and also its sub-dimensions including confidence in Science and Technology lesson, the ability to cope with the difficulties in Science and Technology and the confidence in performing Science and Technology tasks?" subproblem have been given in Table 3.

**Table 3. Elementary school pupils' self-efficacy towards the Science and Technology lesson.**

Sub-dimensions of self-efficacy	Score Interval	N	Mean	SD	Min	Max	The number of items	Level
Confidence in science and technology lesson	Totally Disagree Disagree Indecisive Agree Totally Agree	705	4.09	0.677	1.07	5.00	15	A
Coping with the difficulties in Science and Technology	Totally Disagree Disagree Indecisive Agree Totally Agree	705	3.63	0.875	1.00	5.00	6	A
Confidence in performing Science and Technology tasks	Totally Disagree Disagree Indecisive Agree Totally Agree	705	4.14	0.823	1.17	5.00	6	A
Total scale	Totally Disagree Disagree Indecisive Agree Totally Agree	705	4.00	0.636	1.48	5.00	27	A

A: Agree

When Table 3 is examined, it is seen that the mean of the general self-efficacy levels in Science and Technology lesson of pupils studying at elementary schools is  $\bar{X} = 4.00$ . When this value is compared with the points that can be taken from this scale, it gives the AGREE level and it demonstrates that the self-efficacy of pupils towards Science and Technology lesson is at a high level. As it can be inferred from the table, the sub-dimensions, namely; *confidence in Science and Technology lesson* ( $\bar{X} = 4.09$ ),  *coping with the difficulties in Science and Technology* ( $\bar{X} = 3.63$ ) and *confidence in performing Science and Technology tasks* ( $\bar{X} = 4.14$ ) mean points are at high levels. It shows that pupils studying at elementary school have positive self-efficacy towards Science and Technology lesson.



*The Findings of the Second Subproblem*

The statistical findings about the “Do the elementary school pupils’ self-efficacy of Science and Technology and its sub-dimensions including confidence in Science and Technology lesson, the ability to cope with the difficulties in Science and Technology and the confidence in performing Science and Technology tasks differ in terms of the variables such as gender, grade level, the level of parents’ education, reading scientific books and watching scientific documentaries?” subproblem have been given in Tables.

**Table 4. Elementary school pupils’ self-efficacy towards the Science and Technology lesson in terms of gender.**

Sub-dimensions of self-efficacy	Gender	N	Mean	SD	t	p
Confidence in Science and Technology lesson	Girl	370	4.10	0.66	0.423	0.673
	Boy	335	4.07	0.69		
Coping with the difficulties of Science and Technology	Girl	370	3.61	0.85	-0.437	0.662
	Boy	335	3.64	0.90		
Confidence in performing Science and Technology tasks	Girl	370	4.25	0.77	3.85	0.000*
	Boy	335	4.02	0.85		
Total scale	Girl	370	4.02	0.63	1.22	0.221
	Boy	335	3.96	0.64		

\* Only statistically significant differences at  $p < .05$  are reported. All other differences were not significant.

As seen in Table 4, there is a meaningful difference ( $p < 0.05$ ) in terms of gender in the sub-dimension of “confidence in performing Science and Technology tasks”. In other words, the girls’ confidence in performing Science and Technology tasks is higher than that of boys. On the other hand, there is no difference in terms of gender in the sub-dimensions of “confidence in Science and Technology lesson” and “coping with the difficulties of Science and Technology.” When the self efficacy of pupils’ towards Science and Technology has been examined in general, it is seen that there is no meaningful difference in terms of gender.

**Table 5. Elementary school pupils’ self-efficacy towards the Science and Technology lesson in terms of grade level.**

Sub-dimensions of self-efficacy	Grade level	N	Mean	SD	F	p	Meaningful difference
Confidence in Science and Technology lesson	6th grade	210	4.20	0.68	5.12	0.006*	6th grade * 7th grade
	7th grade	226	3.99	0.74			
	8th grade	269	4.07	0.59			
Coping with the difficulties of Science and Technology	6th grade	210	3.69	0.91	0.811	0.445	No difference
	7th grade	226	3.58	0.89			
	8th grade	269	3.62	0.82			
Confidence in performing Science and Technology tasks	6th grade	210	4.18	0.88	0.632	0.532	No difference
	7th grade	226	4.10	0.86			
	8th grade	269	4.14	0.73			
Total scale	6th grade	210	4.08	0.62	3.36	0.035*	6th grade * 7th grade
	7th grade	226	3.92	0.70			
	8th grade	269	3.99	0.57			



Table 5 indicates that there is a meaningful difference in terms of grade level in the sub-dimension of "confidence in Science and Technology lesson", and in the general scale. Also, there is not a meaningful difference in terms of grade level in the elementary school pupils' "confidence in performing Science and Technology tasks Science and Technology lesson" and "coping with the difficulties of Science and Technology" sub-dimensions.

Still, the 6<sup>th</sup> grade pupils' mean points of the self efficacy towards Science and Technology lesson and mean points of subdimensions are higher than the other grade levels. As a result of Scheffe analysis, it has been found out that the meaningful difference occurs between the 6<sup>th</sup> grade and 7<sup>th</sup> grade pupils.

**Table 6. Elementary school pupils' self-efficacy towards the Science and Technology lesson in terms of mother's education level.**

Sub-dimensions of self-efficacy	Education level	N	Mean	SD	F	p	Meaningful difference
Confidence in Science and Technology lesson	Elementary school	249	3.92	0.67	13.49	0.000*	Elementary Sch * High Sch Elementary Sch * College Elementary Sch * College High Sch * College
	Middle school	113	4.00	0.69			
	High school	188	4.14	0.70			
	College	155	4.34	0.54			
Coping with the difficulties of Science and Technology	Elementary school	249	3.47	0.83	15.53	0.000*	Elementary Sch * High Sch Elementary Sch * College Elementary Sch * High Sch Elementary Sch * College High Sch * College
	Middle school	113	3.35	0.96			
	High school	188	3.72	0.85			
	College	155	3.96	0.77			
Confidence in performing Science and Technology tasks	Elementary school	249	4.05	0.81	7.947	0.000*	Elementary Sch * College Elementary Sch * College High Sch * College
	Middle school	113	4.01	0.89			
	High school	188	4.11	0.86			
	College	155	4.41	0.65			
Total scale	Elementary school	249	3.85	0.59	17.03	0.000*	Elementary Sch* High Sch Elementary Sch* College Elementary Sch* College High Sch * College
	Middle school	113	3.86	0.64			
	High school	188	4.04	0.68			
	College	155	4.27	0.52			

When Table 6 is examined, there is a meaningful difference ( $p < 0.05$ ) in terms of mother's education level in the sub-dimensions of "confidence in Science and Technology lesson", "coping with the difficulties of Science and Technology", "confidence in performing Science and Technology tasks" and in the general scale. In other words, it can be said that mother's education level is effective elementary school pupils' self-efficacy toward Science and Technology lesson. Those whose mothers are college graduates have higher self-efficacy of Science and Technology in all the sub-dimensions and the general scale.

**Table 7. Elementary school pupils' self-efficacy towards the Science and Technology lesson in terms of father's education level.**

Sub-dimensions of self-efficacy	Education level	N	Mean	SD	F	p	Meaningful difference
Confidence in Science and Technology lesson	Elementary school	157	3.90	0.73	12.58	0.000*	Elementary Sch. * High Sch. Elementary Sch. * College Elementary Sch. * College High Sch. * College
	Middle school	105	3.96	0.68			
	High school	217	4.07	0.70			
	College	226	4.29	0.53			
Coping with the difficulties of Science and Technology	Elementary school	157	3.50	0.87	11.11	0.000*	Elementary Sch. * High Sch. Elementary Sch. * College Elementary school* High Sch. Elementary Sch. * College High Sch. * College
	Middle school	105	3.36	0.91			
	High school	217	3.59	0.83			
	College	226	3.88	0.83			



Sub-dimensions of self-efficacy	Education level	N	Mean	SD	F	p	Meaningful difference
Confidence in performing Science and Technology tasks	Elementary school	157	4.02	0.87	7.36	0.000*	Elementary Sch. * High Sch. Elementary Sch. * College High Sch. * College
	Middle school	105	4.01	0.89			
	High school	217	4.07	0.85			
	College	226	4.35	0.67			
Total scale	Elementary school	157	3.84	0.64	15.10	0.000*	Elementary Sch. * College Elementary Sch. * College High Sch. * College
	Middle school	105	3.84	0.66			
	High school	217	3.97	0.66			
	College	226	4.21	0.52			

As seen in Table 7, there is a meaningful difference ( $p < 0.05$ ) in terms of father's education level in the sub-dimensions of the elementary school pupils' confidence in Science and Technology lesson, coping with the difficulties of Science and Technology, confidence in performing Science and Technology tasks and in the general scale. In other words, it can be said that father's education level is effective in the pupils' self-efficacy towards Science and Technology lesson. Those whose fathers are college graduates have higher self-efficacy towards Science and Technology in all the sub-dimensions and the general scale.

**Table 8. Elementary school pupils' self-efficacy towards the Science and Technology lesson in terms of mother's profession.**

Sub-dimensions of self-efficacy	Mother's profession	N	Mean	SD	F	p	Meaningful difference
Confidence in Science and Technology lesson	Housewife	431	4.00	0.69	12.09	0.000*	Housewife * Civil Serv. Worker * Civil Servant
	Worker	88	3.97	0.68			
	Self-employed	34	4.14	0.75			
	Civil Servant	152	4.36	0.51			
Coping with the difficulties of Science and Technology	Housewife	431	3.53	0.87	11.95	0.000*	Housewife * Civil Serv. Worker * Civil Servant
	Worker	88	3.47	0.80			
	Self-employed	34	3.63	0.94			
	Civil Servant	152	3.98	0.79			
Confidence in performing Science and Technology tasks	Housewife	431	4.05	0.86	6.15	0.001*	Housewife * Civil Serv.
	Worker	88	4.14	0.77			
	Self-employed	34	4.20	0.85			
	Civil Servant	152	4.38	0.64			
Total scale	Housewife	431	3.91	0.64	14.46	0.000*	Housewife * Civil Serv. Worker * Civil Serv.
	Worker	88	3.90	0.56			
	Self-employed	34	4.04	0.71			
	Civil Servant	152	4.28	0.52			

When the Table 8 is examined, there is a meaningful difference ( $p < 0.05$ ) in terms of mother's profession in the sub-dimensions of the elementary school pupils' confidence in Science and Technology lesson, coping with the difficulties of Science and Technology, confidence in performing Science and Technology tasks and in the general scale. In other words, it can be said that mother's profession is effective in the pupils' self-efficacy towards Science and Technology lesson. Those whose mothers are civil servants have higher self-efficacy of Science and Technology in all the sub-dimensions and in the general scale than the ones whose mothers are employed in different professions and as housewives.





**Table 9. Elementary school pupils' self-efficacy towards the Science and Technology lesson in terms of father's profession.**

Sub-dimensions of self-efficacy	Father's profession	N	Mean	SD	F	p	Meaningful difference
Confidence in Science and Technology lesson	Worker	246	3.96	0.70	16.55	0.000*	Worker * Civil Serv. Self-empl. * Civil Serv.
	Self-employed	218	4.01	0.71			
	Civil Servant	241	4.28	0.55			
Coping with the difficulties of Science and Technology	Worker	246	3.44	0.86	16.59	0.000*	Worker * Civil Serv. Self-empl. * Civil Serv.
	Self-employed	218	3.56	0.88			
	Civil Servant	241	3.88	0.81			
Confidence in performing Science and Technology tasks	Worker	246	4.02	0.90	9.93	0.000*	Worker * Civil Serv. Self-empl. * Civil Serv.
	Self-employed	218	4.07	0.85			
	Civil Servant	241	4.33	0.65			
Total scale	Worker	246	3.86	0.62	21.08	0.000*	Worker * Civil Serv. Self-empl. * Civil Serv.
	Self-employed	218	3.92	0.67			
	Civil Servant	241	4.20	0.54			

Table 9 indicates that there is a meaningful difference ( $p < 0.05$ ) in terms of father's profession in the sub-dimensions of the elementary school pupils' confidence in Science and Technology lesson, coping with the difficulties of Science and Technology, confidence in performing Science and Technology tasks and in the general scale. In other words, it can be said that father's profession is effective in the pupils' self-efficacy towards Science and Technology lesson. Those whose fathers are civil servants have higher self-efficacy of Science and Technology in all the sub-dimensions and in the general scale than the ones whose fathers are workers and self-employed.

**Table 10. Elementary school pupils' self-efficacy towards the Science and Technology lesson in terms of reading scientific books.**

Sub-dimensions of self-efficacy	Reading scientific books	N	Mean	SD	t	P
Confidence in Science and Technology lesson	Read	442	4.24	0.62	8.42	0.000*
	Do not read	263	3.82	0.68		
Coping with the difficulties of Science and Technology	Read	442	3.83	0.81	8.42	0.000*
	Do not read	263	3.28	0.86		
Confidence in performing Science and Technology tasks	Read	442	4.33	0.71	8.55	0.000*
	Do not read	263	3.81	0.89		
Total scale	Read	442	4.17	0.56	10.22	0.000*
	Do not read	263	3.70	0.64		

When the Table 10 is examined, there is a meaningful difference ( $p < 0.05$ ) in terms of reading scientific books in the sub-dimensions of the elementary school pupils' confidence in Science and Technology lesson, coping with the difficulties of Science and Technology, confidence in performing Science and Technology tasks and in the general scale. In other words, it can be said that reading scientific books is effective for pupils' self-efficacy toward Science and Technology Lesson. The pupils who state that they read scientific books have higher self-efficacy of Science and Technology in all the sub-dimensions and in the general scale when compared with those who state that they do not.



**Table 11. Elementary school pupils' self-efficacy towards the Science and Technology lesson in terms of watching scientific documentaries.**

Sub-dimensions of self-efficacy	Watching scientific documentaries	N	Mean	SD	t	p
Confidence in Science and Technology lesson	Watch	506	4.17	0.66	5.20	0.000*
	Do not watch	199	3.88	0.65		
Coping with the difficulties of Science and Technology	Watch	506	3.73	0.87	5.10	0.000*
	Do not watch	199	3.36	0.80		
Confidence in performing Science and Technology tasks	Watch	506	4.24	0.78	5.33	0.000*
	Do not watch	199	3.88	0.86		
Total scale	Watch	506	4.09	0.62	6.22	0.000*
	Do not watch	199	3.76	0.60		

As seen in Table 11, there is a meaningful difference ( $p < 0.05$ ) in terms of watching scientific documentaries in the sub-dimensions of the elementary school pupils' confidence in Science and Technology lesson, coping with the difficulties of Science and Technology, confidence in performing Science and Technology tasks and in the general scale. In other words, it can be said that watching scientific documentaries is effective for pupils' self-efficacy toward Science and Technology Lesson. The pupils who state that they watch scientific documentaries have higher self-efficacy of Science and Technology in all the sub-dimensions and in the general scale when compared with those who state that they do not.

### Discussion and Implication

The aim of the study is to determine 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> grade pupils' level of self-efficacy towards Science and Technology lesson and also determining the levels of its sub-dimensions including confidence in Science and Technology lesson, the ability to cope with the difficulties in Science and Technology and the confidence in performing Science and Technology tasks. Whether there is a meaningful difference in elementary school pupils' self-efficacy of Science and Technology and its sub-dimensions regarding variables such as gender, grade level, and the level of parents' education, reading scientific books and watching scientific documentaries also constitute the aim of this study. As a result of the applied analysis, elementary school pupils' self-efficacy towards Science and Technology lesson appears to be positive in the general scale and all sub-dimensions. According to Pajares & Schunk (2001), a powerful self-efficacy increases the individual's success. Those who have higher self-efficacy are more concerned with the subjects and are deeply involved in the activities, set persevering goals and they have a strong sense of responsibility. Also, in Science and Technology education, having high levels of self-efficacy towards Science and Technology lesson is important for the students' success and self-development.

The pupils are at the level of agreeing and are positive for the sub-dimension of confidence in Science and Technology lesson. In other words, they state positive ideas that they can overcome the difficulties they encounter in Science and Technology lesson; they have the necessary abilities to be successful in Science and Technology, they can accomplish their Science and Technology projects no matter how difficult they are, they can comprehend the subjects in Science and Technology and they study confidently in Science and Technology subjects.

The sub-dimension of coping with Science and Technology is also at the level of agreeing. In other words, pupils state positive ideas that they are not anxious about the problems and exams in Science and Technology lesson, they do not have difficulty in solving problems, they are not afraid of not answering science teachers' questions and not getting the result of experiments and they are able to understand Science and Technology concepts.

The sub-dimension of confidence in performing Science and Technology is also at a positive level. Pupils utter positive ideas that they are eager to get Science and Technology research assignments, they



can do their Science and Technology assignments on their own, when they strive, they can learn Science and Technology subjects and difficult though their assignments might be, they do not give up.

When the other results of the study are examined, the self-efficacy towards Science and Technology lesson and the sub-dimensions of this self efficacy including their confidence in Science and Technology lesson and their ability to cope with the difficulties in Science and Technology and their confidence in performing Science and Technology tasks differ in terms of gender, grade level, the level of parents' education, reading scientific books and watching documentaries variables.

Pupils' confidence in performing Science and Technology tasks differs in terms of gender; it does not make a meaningful difference in the sub-dimensions of confidence in Science and Technology lesson and coping with the difficulties of Science and Technology. The confidence of 6<sup>th</sup> grade pupils in Science and Technology lesson is higher when compared with other grades in terms of grade level. On the other hand, it is concluded that in all sub-dimensions the pupils' self-efficacy differs in Science and Technology lesson in terms of parents' education level and profession. In other words, it is possible to say that the children, whose parents are college graduate and civil servant, have more confidence in Science and Technology; they can overcome difficulties and have more confidence in performing Science and Technology tasks when compared with the others. Moreover, it was concluded that the pupils who read scientific books and watch scientific documentaries are more confident in Science and Technology, they can cope with Science and Technology and are confident in performing Science and Technology tasks when compared with those who do not read or watch.

While the self-efficacy towards the Science and Technology lesson of pupils at the elementary school differ in terms of grade, level of parents' education, parents' profession, reading scientific books and watching scientific documentaries variables, there hasn't been found a meaningful difference for the gender variable. Namely, it is possible to say that, gender does not make any meaningful difference of elementary school pupils' self-efficacy towards the Science and Technology lesson. As a result of the study that has been conducted with 272 children aged between 12 and 15, Bandura, A., Barbaranelli, C., Caprara, G.V. & Patorelli, C. (2001) have found out that the self-efficacy does not make a difference in terms of gender. The fact that the pupils whose parents are college graduates and civil servants have higher self-efficacy towards Science and Technology lesson might be thought as stemming from these parents' awareness of Science and Technology and from letting their children be aware of this as well. The individuals, who are persuaded that they have the capacity to accomplish the given tasks, tend to spend more energy. These individuals continue to spend their energy without caring about their incompetence and being suspicious of their efficacy even when a problem occurs. The oral support of persuasion for the self-efficacy gives way to go on with the individuals' attempts and supports developing personal self-efficacy (Bandura, 1994). By the way, they might perceive themselves as efficient for the lesson. It is also believed that the pupils who state that they read scientific books and watch scientific documentaries are interested in Science and Technology lesson. Hence, it is possible to say that the pupils who are interested in Science and Technology lesson have higher self-efficacy towards Science and Technology lesson. It appears that 6<sup>th</sup> grade pupils have higher self-efficacy when compared to other pupils in terms of grade level. The reason for this might be that Science and Technology issues are getting deeper in terms of grade level; therefore it is thought that 6<sup>th</sup> grade pupils may find issues easier and more comprehensible. It has been discovered in different studies in the literature that the self-efficacy level might differ in terms of years in the study period (Multon, Brown & Lent, 1991. Quoted in: Abak, Eryılmaz & Fakioglu, 2002).

## Conclusion

It has been found out that the self-efficacy of elementary school pupils towards Science and Technology lesson is positive in general terms. While the self-efficacy toward Science and Technology of the pupils differ in terms of the variables such as grade level, the level of parents' education, reading scientific books and watching scientific documentaries, it appears that it does not differ in terms of gender in the general scale. When the sub-dimensions of the scale are examined, it has been found that girls are more confident in performing scientific tasks than boys. The confidence of 6<sup>th</sup> grade pupils



towards Science and Technology lesson is higher than the other grade levels. In addition, it is possible to say that those whose parents are college graduates and civil servants are more confident in Science and Technology, they can cope with the difficulties in Science and Technology better and they are more confident in performing Science and Technology tasks. On the other hand, it has been concluded that the pupils who read scientific books and watch scientific documentaries are more confident in Science and Technology, they can cope with Science and Technology and they are confident in performing Science and Technology tasks when compared with those who do not read or watch.

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**Esra Uçak**

Research Assistant at the University of Pamukkale in Turkey, Pamukkale University, Faculty of Education, Department of Science Education, 20020 – Denizli, Turkey.  
Phone: +90 258 2961097.  
E-mail: [eucak@pau.edu.tr](mailto:eucak@pau.edu.tr)

**Hüseyin Bağ**

Professor at the University of the Pamukkale in Turkey, Pamukkale University, Faculty of Education, Department of Science Education, 20020 – Denizli, Turkey.  
Phone: +90 258 2961172.  
E-mail: [huseyinbag@gmail.com](mailto:huseyinbag@gmail.com)

