INVESTIGATION OF PRIMARY EDUCATION 6th, 7th and 8th GRADE STUDENTS' ATTITUDES TOWARDS SCIENCE AND TECHNOLOGY LESSON

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ABSTRACT

This article aims to examine the attitudes of 6th, 7th, and 8th graders', who attend a good conditioned school in Serdivan, Sakarya, towards Science and Technology lesson. It was also examined whether there was a significant difference between attitude scores and girls and boys. In order to find out how to promote students attitudes towards science, 9 students were interviewed. The acquired quantitative data was analyzed in SPSS 13.0. The study findings indicated that there was a significant difference between the attitude to Science and Technology lesson and grades, whereas there wasn't any significant difference between the attitude scores and gender. Moreover, the qualitative data acquired through the interview with students indicated that the attitude towards science can be promoted carrying out more experiments and applying student-centered education.

Keywords: *Primary education, science and technology lesson, gender, attitude, mixed methods research.*

INTRODUCTION

Bringing up qualified individuals is one of the crucial goals that societies give importance to. Being able to realize this goal is only possible through education and instruction. It is impossible not to see the effects of the innovations taking place in the science world and technology as an extension of these innovations on people's lives in our daily life. For this reason, in order for the students to be able to sufficiently learn the science subjects which are offered in school curricula, these subjects should be made meaningful for them and positive attitudes should be developed (Erdemir & Bakırcı, 2009). Especially, development of societies and their keeping up with the times are possible through bringing up qualified individuals and making this functional.

That science is getting more and more complicated everyday has made it compulsory for the individuals to be science and technology literate (Aydın, Sucuoğlu & Balım, 2009). The vision of Science and Technology Curriculum in Primary Education is 'to aim at educating all the students, no matter what individual differences they may have, as science

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and technology literate; and, as for the science and technology literacy, it is described as 'a combination of science-related skills, attitudes, values, perceptions and knowledge which are necessary for the individuals to develop the skills of research-questioning, critical thinking, problem solving and decision making, to become lifelong learners and to maintain their curiosity about the world and their environment (Education and Morality, 2006).

In science lessons, students should be taught not only the knowledge that they need in the class hour, but also problem solving skills, rational thinking and developing positive attitudes that will enable the students to use what

they learn in the class in daily life (Erdemir & Bakırcı, 2009). The aim of Science and Technology lessons is to enable students to learn about the physical, chemical and biological phenomenon and events taking place in their environment together with their functionality and meanings (Bahar, 2006).

In Science and Technology lessons, the purpose for students is not to memorize the scientific information but to transform this knowledge into their everyday lives, to know what to do and how to react when they encounter a situation and to gain thinking skills which are similar to that of a scientist (Demirbaş & Yağbasan, 2006). The focus of science education is to enable students to assess the knowledge that they gain in schools with a new perspective and to reflect this knowledge on their future lives (Bilgin & Geban, 2004). High-quality science education also contributes to students' critical thinking skills (Sert Çıbık, 2009).

That people who have received science education can read, understand and interpret scientific information is thanks to the science and technology literacy that they have gained. Emergence of such reactions has caused individuals to select science courses, follow scientific information, take up hobbies related to science and develop positive attitudes (Kozcu Çakır, Şenler & Göçmen Taşkın, 2007).

One of the student features that have an important effect on the learning process is student's attitudes towards the lesson (Altınok, 2004). Attitude is a combination of positive or negative, learned and consistent behaviors towards a specific object (Magno, 2003). Turhan, Aydoğdu, Şensoy and Yıldırım (2008) describe attitude as an individual's tendency to behave positively or negatively towards any event, object or group of people. They put forward that attitudes are not behaviours but that they are tendencies to display some behaviours and that they are abstract concepts; however, they stated that attitudes are possible to observe as in an individual's forming a good or bad opinion of an event, reaching a decision and reflecting it on his behaviours. As for Demirel and Ün (1987), they expressed that an attitude is a positive or negative reaction to an object, an event or a person. Attitudes are related to academic achievement because they develop in the learning environment in time (Magno, 2003). According to Bandura (1977), attitudes are often used together with motivation in order to achieve something.

According to functional theories, individuals develop attitudes towards objects that are in line with their needs. In that case, attitudes are the most beneficial ways for individuals' needs (Erden, 1995).

Basically, attitude is based on two features. One is that they are long-lasting and the other one is that they are cognitive, affective and behavioral. These two features are dynamic and they affect each other. In primary education, Science and Technology lesson is one of the least liked and most feared lessons (AÖF Ders Kitabı, 2007). In addition, it is one of the lessons that students have problems understanding and that they fail (Durmaz & Özyıldırım, 2005).

The purpose of measurement of attitudes in education and instruction might be to predict the behaviours that individuals are likely to exhibit in time or in the future, and based on this prediction, change the existing ones and create new situations (Nuhoğlu, 2008).

As attitude being a difficult affective variable to define, 'attitude toward science' can be defined as a belief system or a set of values that are towards an object that is a product of science, science lesson or reflections of science on the society. Attitudes related to science are connected to student participation in science lessons and exhibiton of effective performance (Norby, 2003). While Gardner has described science-related attitude as a learned tendency to evaluate objects, people, events and situations in a specific way or a set of propositions related to science, Martinez, in his studies that aimed at determining the effects of attitudes on science education, has put forward that students' attitudes towards science lessons affect their academic achievement, their gaining scientific attitudes and their tendency to continue studying in the field of science (cited in. Altınok, 2004).

In the learning process, teachers' attitudes and behaviours have an influence on students' attitudes. When students meet their teacher in a new class, they are open to any interaction which is likey to come from the teacher.During this process, students get to know their teacher and develop ideas and feelings about him. In teacher-student relationship, teachers' dominant- obedient or hostile- affective attitudes affect students' attitudes related to the lesson (cited in. Altınok, 2004).

A science lesson based on technology should be perfromed in a learning environment which is applied, cooperative and constructive. Students should get feedback from their teachers at the end of the activities. Students' attitudes towards the lessons are related to their participation in the lesson. In an international study (20 countries), it was revealed that students' participation in the lesson enhanced their attitudes. Since students' participation in the lesson increases with teachers who perform activities during the lessons, students' attitudes are enhanced, too (Norby, 2003).

It is very important that teachers working in state schools exhibit positive attitudes in science lessons. That teachers

think rationally, implement the processes specified in the curriculum effectively and behave objectively have an important role in students' developing positive attitudes during the lessons. Moreover, teachers' implementing their lessons in a way that they are informed about the latest developments in science education makes theis process even more positive and productive (Ediger, 2001).

As the purpose of science education being to develop positive attitudes towards science regardless of gender, many studies that have been carried out show that male students' attitudes towards science are more positive than that of female students. The reasons for this have been determined as cultural effects and male students'having more interaction with technological devices compared to female students. In addition, it has been emphasized that interests and activities in the early childhood period shape one's future actions (cited in Azizoğlu & Çetin, 2009). Catasabis (1995) state that gender does not affect attitudes towards science, whereas Boone (1997) puts forward that gender has an influence on attitudes towards science and even that girls' attitude points are different from boys' attitude points (cited in Sorge, 2007).

Problem Definition

Is there a statistically significant difference among the science and technology lesson attitude scale points of primary 6th, 7th and 8th grade students?

Sub Problems

1. Do primary school students' attitudes differ significantly according to grade level?

2. Do primary school students' attitudes differ significantly according to gender?

3. What are the factors that affect primary school students' attitudes positively?

Assumptions Of The Study

It was assumed that the students responded to the questions honestly during the study.

Limitations Of The Study

This study was limited to Serdivan district of Sakarya province and so it could not be generalized to the province or the country.

Findings are limited to the data collected through data collection tool.

METHOD

Study Design

A mixed methods research design was used in order to realize the purpose (general purpose) of this study. Generally, a mixed methods design is when researchers seek answers to a question or questions by using both qualitative and quantitative data (Nagy & Biber, 2010, p.3). As known, quantitative studies focus on the relationships among variables (Denzin & Lincoln, 1998, p.8) and tyr to answer the question of 'how much' whereas qualitative studies focus on the process and seek answers to the questions of 'why and how' (Yıldırım & Şimşek, 2008). Researchers who use mixed methods designs can collect quantitative data through standard tests, scales, true-false tests or grading scales while they can gather qualitative data via interviews, open-ended written questions, focus group interviews, journals, documents, written boks or works of art (Brannen & Halcomb, 2009, p.68). It is sometimes the best way to use a mixed method that merges qualitative and quantitative methods (Muijs, 2004, p.6). Using a mixed method provides the balance by strengtening the weak points of other methods and is a valuable strategy to reveal empirical records related to the topic (Axinn & Pearce, 2006, p.58-59).

Population And Sample

The population of the study comprises all the secondary stage students in primary schools in Serdivan district of Sakarya province while the sample is composed of a total of 90 students- 47 females and 43 males- in the 6 th, 7 th and 8 th grades of a primary school with a high socioeconomic level. In most of the study, sample was selected through simple random sampling. Simple random sampling is a method in which each sample is given an equal chance to be chosen and the chosen units are accepted as the sample (Büyüköztürk, Çakmak, Akgün, Karadeniz & Demirel, 2009). As for the interview method used in the qualitative part of the study, convenience sampling was made use of. Convenience sampling earns the study speed and practicality (Yıldırım & Şimşek, 2008).

Participants

While collecting data during the study, three students from among the students of each 6th, 7th and 8th grades – a total of 9 students- were interviewed.

Data Collection Techniques

In the study, science attitude scale which was developed by Geban, Ertepınar, Yılmaz, Altın and Şahbaz (1994) was used in order to find out students' attitudes towards science lesson. Attitude scales are one of the most prominent and commonly used methods of measuring attitudes. The most commonly used one among attitude scales is Likert scale. In Likert-type scales, a lot of positive and negative items related to the attitude to be measured are written. For these items, reactions are stated in the form of expressions "I totally agree" "I agree" "I neither agree nor disagree" "I don't agree" "I definitely disagree".

Cronbach - α reliability coefficient for the attitude scale that was used in this study was calculated as 0.916.

According to the results of the factor analysis, items in the Science and Technology Lesson attitude scale were grouped under two factors and the variance ratio that these two factors explained on the scale was 1,72 while the total variance was % 49,32. The common variance that these two factors explained on the items varied approximately between % 32 and % 72. These two basic factors were categorized as positive and negative.

In this scale, 1., 2., 3., 4., 5., 7., 8., 10., 11., 12. and 15. are positive items.

Sample items:

Science is a field that I like a lot.

I like reading books related to Science.

Science has an important role in daily life.

I like solving problems related to Science in the lessons.

6., 9., 13. and 14. are negative items .

6. I have trouble attending Science and Technology lessons.

9. I feel bored when studying Science.

13. Science and Technology lesson is unlikeable among others.

14. It is not attractive for me to take part in discussions related to Science and Technology subjects.

Negative items were transfered to the statistics program by being corrected via converting the points

In order to elicit students' reflective opinions as part of the qualitative dimension of the study, a seven-item semi-structured interview form was prepared and implemented in a semi-structured format. Karasar (2010) categorises interviews in three groups as structured, unstructured and semi-structured according to the implemented rules. Unstructured or semi-structured interviews are rather flexible, let the interviewees change the direction of the interview and reveals new topics that the researcher did not consider while designing the items (Axinn & Pearce, 2006, p.27).

Interviews were carried out with students in a face-to-face fashion and they were recorded via a tape recorder by students' consent. Later, the recorded interviews were listened, transfered to the computer and transformed.

Data Analysis

The collected data were analyzed by using SPSS 13 package program. Frequency values were used to show students' distribution in terms of grade levels and gender, and the gathered data were analyzed by using independent-samples t-test and one way ANOVA in the SPSS program.

Content analysis was used while analyzing the qualitative data. Content analysis is a technique in which the researchers categorize the concepts that came out by conceptualizing the data which was transformed into written form under common themes in a logical way (Yıldırım & Şimşek, 2008). Categories were produced via an inductive analysis by coding the raw data collected through the interviews. Data were grouped under the specified categories so as to make them meaningful fort he readers. Coding and categorization processes were performed by one of the researchers in a repetitive fashion. Thus, sticking to the reseacrh problem and the purpose, unnecessary codes were omitted and new codes were added to some parts when necessary. The researchers worked together while naming the categories, though. As a result, tables in which each and every participant's opinions related to the topic could be seen separately were obtained.

FINDINGS AND COMMENTS

In this part, findings that were obtained as a result of the data analysis carried out to find answers to the problem and sub-problems were included.

Analysis Of The Quantitative Data

First of all, One Sample Kolmogorov – Simirnov test was performed to test whether the analysis to be carried out was parametric analysis or not. As a result of the analysis, it was seen that attitude scale points had a normal distribution (Kolmogorov – Simirnov $Z = 1{,}066$, $p = .206 > .05$). Büyüköztürk (2010) suggests examining the variables with a normal distribution through parametric tests.

Attitudes Of Students In Different Grades Towards Science Lesson

Table.1.a. Descriptive Statistics of Attitude Scale Points

Grade	N	$\overline{X}$	S_S
6	30	26,03	6,55
7	30	43,56	10,03
8	30	46,00	7,95

Table.1.b. ANOVA Results of Students' Attitude Scale Points according to Grades

Source of variance	Sum of Squares	S_d	Mean Squares	F	p	Significant difference
Between groups	7120,067	2	3560,033	51,618	,000	8-7, 6-7
Within groups	6000,333	87	68,969			
Total	13120,4	89				

*p < .05

In the results of the independent-samples one-way analysis of variance (One-way ANOVA), a statistically significant difference between students' grade levels and their attitude scale points was discovered (F (2, 87) = 51,618 , p < .05).

According to the analysis results, students' attitude points vary according to the grade they belong to. The results of the Scheffe Test which was performed to find out between which grades the significant differences occurred show that attitude scale means of the 6th graders (X = 46,00) and the 8th graders (X = 43,56) were higher than that of 7th graders (X = 26,03). Attitude points of the 6th and the 8th graders exhibit a difference compared to the attitude points of the 7th graders.

The Effect Of Gender On Attitudes

Independent t-test was performed in order to find out whether there was a significant difference between attitude points and gender.

Table.2. Independent t-test Results related to Students' Gender and Attitude Points

Gender	N	$\bar{X}$	S	t	p
Female	47	35.44	12,9	2,602	0,11
Male	43	41.90	10,3		

*p < .05

When all the students were taken into consideration, no significant difference was detected between students' gender and their attitudes towards Science and Technology lesson according to the results of the independent t-test. There is no significant relationship between gender and attitude points.

The results of the analysis carried out show that the effect size of gender variable on the differences among points in the attitude scale is at medium level (Büyüköztürk, 2010). It can be stated that % 7 of the variance observed in the attitude scale points can be explained by gender (η^2 = .07 > .06).

Analysis of the Qualitative Data

Obtained findings for every question directed to the participants are presented below in the tables.

Item 2: *'' Which lesson do you like most? ''*

Answers that participants gave for item 2 are presented in Table 3 below.

Table 3: Participants' answers for item 2

	Mathematics	Science and Technology	Social Sciences	Turkish
S1	✓	✓	✓	
S2		✓		
S3	✓			
S4			✓	
S5	✓	✓		
S6				✓
S7	✓	✓		✓
S8		✓		
S9	✓	✓		
f	5	6	2	2

When the participants were asked which lesson they liked most, some of them responded that they liked maths, science and technology and social sciences at the same time while one of the participants stated that s/he liked only social sciences. Some others replied that they liked maths, science and technology and Turkish.

Item 3: '' For Science and Technology lesson, if you like it, why? If not, why not? ''

Answers that participants gave for item 3 are presented in Table 4 below.

Table 4: Analysis results of the answers that participants gave for item 3

	Learning process	*f*
Lesson processes	enjoable	4
	boring	1
	interesting	1
	Negative teaching effect	1
	Positive teaching	1
	Memorized science	1
	Matemathical operations	1
Difficulty of the subjects	Complexity of the subjects	1
	Difficult subjects	2
Transfer for real life	Current issues	4
Σ		17

When the participants were asked why they liked or didn't like Science lessons, codes of "enjoyable, intersting, boring, negative taching effect, memorization, positive teaching effect, mathematical operations" were categorized under the theme of lesson processes (10), while the increasing complexity level of the subjects and the difficulty level of a subject at hand were grouped under the theme of difficulty of the subjects (3). The code for transferring the science subjects to real life was categorized under the theme of transfer for real life (4). Participants stated that they liked science lessons because they were enjoyable and because of the effect of sense of humour that kept the science lessons away form monotony. A group of participants expressed that they liked science because it was related to real life. The integration of science with maths and the science subjects' getting more and more comprehensive in time are also reflected on the participants' opinions. Particiants' opinions related to this question are as below:

-' Subjects are already from our daily lives. So, they are more interesting' .(S1, 6th grade)

-'I can't understand the lessons very well. It might be because of the teacher. Or maybe because the subjects

are getting more complicated, but my interest in science decreased.' (S3,7th grade)

-' Because the subjects in Science and Technology are very difficult and a little bit boring.' (S4 , 7th grade)

-' Because I fing the lessons enjoyable.' (S5 , 8th grade)

-' I like my Science and Technology teacher, I find the lessons educational, I find science lessons more related to outside world'. (S7, 6th grade)

-' Because there are some mathematical operations and I am bad at maths. But I can succeed in subjects that require memorization. I can't do the ones that require mathematics.' (S6, 8th grade)

In addition, different from these views, one of the participants stated that he liked Science and Technology lesson with the effect of his/her family (especially his/her father) and that Science lesson became a hobby for him/her.

- ' Because my father has engrained this in me since my childhood and also it is related to my hobbies, that's why '. (S8, 7th grade)

Item 4: '' Can you tell me about a science lesson that you enjoyed most?''

Answers that participants gave for item 4 are presented in Table 5 below.

Table 5: Analysis results of the answers that participants gave for item 4

		f
Teaching-learning process	Experiment-based science	2
	SPS Basic skills	1
	CBI	1
	Permanent learning	3
	Cognitive burden	1
Classroom environment	Humour and science	3
	Enjoyable teacher	3
	Enjoyable process	4
	Positive classroom atmosphere	1
Σ		**19**

When the participants were asked to tell a science lesson that they enjoyed most, according to the answers, codes of experiment-based science, SPS (Scientific Process Skilss) basic skills, Computer Based Instruction (CBI), permanent learning, cognitive burden were categorized under the theme of teaching-leraning process (8), whereas the codes of humour and science, enjoyable teacher, enjoyable process, positive classroom atmosphere were categorized under the theme of classroom environment (11). Participants expressed that they derived pleasure from experiment-based science lessons and claimed that their teachers' use of visuals during the lessons had an effect on making what they learned permanent. They also stated that their teacher's implementing the lesson through discussing the subject at hand with the students was more effective than their taking notes and that, as a result, they did not have to deal with taking notes and doing the lesson in this way disburdened their cognitive burdens. Participants stated that they mostly enjoyed the lessons in which the teacher established a closer relationship with the students, made the learning process more fun and allowed for humour at times rather than a lesson in which the teacher lectured only. Some participant opinions related to this question are as follows:

- *' Generally, Y.....teacher both teaches his/her lesson and makes us laugh by telling jokes. In fact, I can say that all our lessons are fun'.* (S1, 6th grade)

- *'In the science lesson that I enjoyed most, we covered the subject of 'bones'. In that lesson, the teacher showed us the bones from the computer. We listened vary carefully and that lesson was good'* (S2 , 6th grade)

- *Lessons that I enjoy most: I take more pleasure in lessons in which we do experiments.'* (S3, 7th grade)

- *'In the science lesson that I enjoyed most, students who talk a lot and disturb the class were absent. Because there was no noise problem, we could cover the subjects very fast. And it was very enjoyable'* .(S4 , 7th grade)

- 'When we do experiments, I understand better and more comfortably. They are more comprehensive and I don't forget them. It is more beneficial.' (S6, 8th grade)

- The science lesson that I enjoyed most, Y …..teacher was teaching again, he was teaching the cells. Y…..teacher always teaches us first,and the next week we write it in our notebooks. He doesn't make us write in the notebooks. Because of this, I enjoy science lessons a lot. There is no writing, one week we listen and the other week the teacher wanst us to transfer what we learn into our notebooks. His teaching is also fun. I may easily get bored when we deal with difficult subjects. When the lesson is more enjoyable, it is more permanent…' (S7, 6th grade).

Item 5: '' Can you tell me your dream science lesson? What should you, your teacher and your friends do in this lesson?''

Answers that participants gave for item 5 are presented in Table 6 below.

Table 6: Analysis results of the answers that participants gave for item 5

		f
Teaching- learning process	Enjoyable process	5
	Experiment-based science	3
	Teacher-student relationship	5
	Permanent learning	4
	Cognitive burden	2
	Concrete experiences	3
	Good teacher	3
Learning environment	Organized classroom environmnet	2
	Interested learning environment	2
	Positive classroom atmosphere	2
	Humour and science	3
	My dream environment	1
	Labarotuary and science	6
Teaching- learning styles	Cooperative learning	1
	Active science	2
	Use of scientific models	2
Σ		46

When the participants were asked the question 'Can you tell us your dream science lesson?', the codes that the answers produced 'enjoyable process (5), experiment-based science (3), teacher-student relationship (5), permanent learning (4), cognitive burden (2), concrete experiences (3) and good teacher (3) were categorized under the theme of teaching-learning process, while the codes of organized classroom environment (2), interested learning environment (2), positive classroom atmosphere (2), humour and science (3), my dream environment (1) and labarotory and science (6) were grouped under learning environment. Cooperative learning (1), active science (2) and use of scientific models (2) were categorized under the theme of teaching-learning styles. Participants of the study described their dream science lesson as one in which they had fun, they had a closer relationship with the teacher, the teacher implemented the lesson using humorous elements, they did experiments when needed, they could concretize the concepts and added that in this way what they learned would be permanent. They also put forward that the lessons should be implemented in environments related to the subject. For example, they stated that lessons could be done in a labarotory or in nature when necessary. In addition, they expressed that a positive classroom environment should be provided when need be. They added that classrooms should be organized, students should be more interested in the lessons and the classroom size should not be big (number of students). Some of the participant opinions related to this question are as follows:

- ' The enironment that we have is almost like my dream science lesson'. (S1, 6th grade)

-' I prefer to do it in a lab..Our teacher is good..the lesson should be fun and it should make us laugh..Jokes should be better so that the lesson can be more enjoyable. The teacher should be enjoyable. Students should not talk too much'. (S2, 6th grade)

- 'I would really like to do science experiments in labs where scientists work. I would like to have our lesson there…my classmates should be more interested in the lesson. They talk too much and the lessons can't be understood. It is as if they don't care about the lesson. Maybe our teacher should explain things more. s/he should explain things instead of having us write the things in the book…I think learning things that develop in labs, for example things that can be shown via experiments, like concrete things, is better and they should be taught in a practical way. We should have a place lika that…the teacher can Show some of the things while teaching. If s/he has the materials, of course. Other than this, s/he should teach better and make the class stop talking in a better way (S3, 7th grade).

-'……The students and the teacher g oto the lab. The teacher teaches everything there in an applied way. The lesson can be done in nature, class or the lab depending on the subject. In my opinion, physics subjects should be covered mostly in class, chemistry subjects in lab and other subjects such as light in nature..(S4, 7th grade).

-' The teacher should be friendly, closer, I mean s/he should both treat us well and teach the lesson effectively. …our books should be more clean and useful, like our test books'. (S6, 8th grade)

- '…… The lesson should be more observation-focused. It shouldn't be boring, and it should be permanent'. (S8, 7th grade)

Item 6: ''What kind of activities do you do related to science and technology?''

Answers that participants gave for item 6 are presented in Table 7 below.

Table 7: Analysis results of the answers that participants gave for item 6

		f
Written material	periodical +	1
	periodical -	8
Visual material	Documentary	8
	TV news with science content	2
	TTNET Vitamin	1
	Internet	1
	Animation	2
SAC	Experiment	2
	Scientific Model	1
	Material	1
	Learning need	2
Science hobby	Keeping journals	1
	Project-based science	2
	Science Art Centre	1
Σ		33

When the participants were asked the question 'What kind of activities related to science and technology do you do?', their answers in terms of following a periodical or not were grouped as following a periodical (1) and not following a periodical (8) and categorized under the theme of written material. The codes for documentary (8), watching TV news with science content (2), benefiting from TTNET Vitamin (1), watching science-related animations (1) were categorized under the theme of visual material, and keeping a journal (1), project-based science (2), visiting the Science Art Centre (SAC) (1) were grouped under the theme of science hobby. Participants stated that they did not follow periodicals and only read them when they came across them. They also stated that they watched documentaries about science and used the internet when they needed it. They expressed that they did experiments in

line with their interest areas and went to the Science Art Centre to develop projects. Some of the participant opinions related to this question are as below:

-' As documentary, I have the National Geographic set. There are some science-related documentaries that I watch in that. ….I mean, there isn't a periodical that I buy every month. I read them only when I come across them… I use TTNET Vitamin.' (S1, 6th grade)

-'…….. we all write journals about what we learn'. (S2, 6th grade)

-'…….For example, the other day I mixed oil and water, and I added a spoonful of salt into it. One day later, small things appeared in it. I really wondered about it. However, I couldn't search it because I didn't have a microscobe. I search things like that, things related to science and technology, on the internet.' (S3, 7th grade).

-'I can now make atomic models using modeling clay. At the moment, I am working on it.' (S4, 7th grade)

-' I watch the news that are connected with science and technology.' (S7, 6th grade)

-' I mostly like to develop projects or do research on a project and ask questions. I watch documentaries, you know, like safari type of documentaries. I follow NTV Science and scientific and technical journals…I used to g oto the Science Art Centre but I had to quit it because of the SBS exam.' (S8, 7th grade).

Item 7: *'' Do you relate science to everyday life? ''*

Answers that participants gave for item 7 are presented in Table 8 below.

Table 8: Analysis results of the answers that participants gave for item 7

		f
Subject	Astronomy	1
	Living things and life	4
	Systems in our bodies	3
	Geology	2
Everyday life	Environmental issues	2
	Medicine	1
	Science-Technology	1
	Active participation	1
	Projects	1
Ideas about science	Epistemological beliefs	1
	Useless science	2
Σ		18

When the participants were asked the question 'Do you relate science to everyday life?', their answers produced some codes. The codes of astronomy (1), living things and life (4), systems in our bodies (3) and geology (2) were merged under the theme of science subjects. Other codes from the participants' answers such as environmental issues (2), medicine (1), integration of science and technology (1), active participation (1) and projects (1) were categorized under the theme of everyday life. Epistemological beliefs (1) and useless science (2) codes were grouped under the theme of ideas about science. Participants stated that they observed the science subjects that they studied at school in their everyday lives, and that they related what they learned to natural events. Some of the participants claimed that the integration of science and technology caused global environmental problems and stated that technology led to environmental pollution. Some participant opinions related to this question are as follows:

-'Science, how can I say, deals with earthqukes…or other natural events like germination. Science researched it and shows us how it happens. What else, it examines the human body. In this way, doctors can get help from science. People's lives can be saved thanks to science. (S1, 6th grade)

- 'Germination of trees, their growth, development, features..how they photosynthesize. …how bones grow?

How our bodies are protected? The circulatory system.' (S2, 6th grade)

- 'In my opinion, science is not very related to everyday life….for example, light that we learn here at school. It says that green light passes through green filter. How can we use this in everyday life? What are we supposed to do with it? I don't think we generally use it.' (S4, 7th grade)

-' ı think about negative things. For example, if people try to do important things related to science, global warming won't get worse. A more effective energy souce can be found instead of nuclear energy. I mean, our environment does not get polluted.' (S5, 8th grade)

-'Yes, I see science-related things especially in space research. Overall, we learn lots of things in science lessons.' (S6, 8th grade)

After the question 'Do you relate science to everyday life?', the participants were asked another question 'Do you consider yourself science-literate?'. The answers are as follows:

Table 9: Analysis results showing students' ideas related to their science and technology literacy

	Number of students								
Science and technology literacy	1	2	3	4	5	6	7	8	9
Basic concepts			☐		☐	☐	☐		
Science leading to knowledge								☐	
Inquisitory nature of science	☐		☐					☐	
STS	☐		☐				☐		

When Table 9 is analyzed, it can be concluded that some of the students did not know what it meant to be science and technology literate, that they did not consider themselves as science and technolgy literates in a sufficient level and that some of them only reflected some specific sub-categories. Some student answers related to this question are as below:

-'For example, an earthquake happened. I can comment on how to help the people, how it occurs, how it can be prevented'. (S1,6th grade)

-'I don't know.' (S2, 6th grade)

-'No, I don't. I would rather see myself as someone who can do the experiments'. (S4 , 7th grade)

-'Yes, because of what we learn in the lessons, we have some knowledge. Because of this knowledge, we are also informed about the news. We know if it will be useful or not, but not always…' (S6, 8th grade)

CONCLUSION AND SUGGESTIONS

In the study we carried out, a significant relationship between the 6th, 7th and 8th grade students' (who all study at different grade levels in primary education) Science and Technology attitude scale points and the grades they attend to. Our study results are also in line with those of Kozcu and the others (2007). Attitude points of 6th graders were calculated as higher than those of 7th graders. When the attitude points of 7th graders and 8th graders of primary education are compared, 8th graders' attitude points were calculated as higher. However, the same difference could not be observed between the students at the 6th and 8th grades. The increase in students' attitude points at the 8th grade might be because these students are preparing for the secondary school exams or due to their social environment, family or teacher factors. The results show paralelism with those of Ekici and Hevedanlı (2010) and Tekbıyık and İpek (2007), whereas they don't support the findings of Azizoğlu and Çetin's studies. This could be related to the difference in the sample. Zusho, Pintrich, Coppola (2005) concluded in their study that attitude points of students at different levels varied according to the groups. In studies carried out by Hendricks ve Barrington (1988), it was concluded that students in different grade levels exhibited differences from each other. Erdemir and Bakırcı (2009) compared the attitude points of students at different grade levels and concluded that there was a significant difference among the attitude points of students studying at different levels. In the comparison of attitude points among grades, it was observed that students' attitude points decreased as the grade level got higher (Cited in Altlnok,

Ün Açıkgöz , 2006). However, our study results contradict with those of Karaer's (2007) study. According to the results of Karaer's study, attitude points do not show a difference in terms of grade levels. We can explain this with the differences in samples.

In this study, when all the students' atttitude-related Science and Technology points were compared to the gender factor, it was concluded that attitudes did not differ significantly according to gender. There was no significant difference between the male or female students' attitude points and their grade levels. In other words, attitude points of students studying at different grades did not exhibit a significant difference in terms of gender. The results of this study are similar to those of Sorge (2003) , Kelly (2008) , Kozcu and the others (2007), whicl all show that gender does not affect students' attitudes. While Gardner claimed in his studies that gender influenced attitudes towards science, other studies carried out in the 1990s revealed that gender had a little influence on these attitudes (Cited in Kozcu et al. , 2007). In studies performed by Serin, Kesercioğlu, Saracaloğlu and Serin (2003); Altınok (2004); Denizoğlu (008); Tekbıyık and İpek (2007); Turhan and the others (2008) and Doğruluk (2010), the results showed that there was no statistically significant difference between attitude scale points and gender. Science points do not differ according to gender. Becker (1989), in his study which was performed in order to identify the differences between attitude points and gender, stated that there were not any significant differences between gender and attitude points. Similarly, Çelikkaleli and Akbaş (2007), in their study which was carried out to investigate the relationship between attitude development and gender differences, expressed that attitudes did not vary significantly in terms of gender. In his study, Altınok (2004) reached the opinion that gender did not affect attitudes. That Bilgin and Geban (2004) could not identify a statistically significant difference between gender and the attitude points that they obtained as a result of their studies support our study results. However, according to the results of the studies they performed, McComas (1996 , Kahle (1996), Norby (2003) concluded that gender had an effect on attitudes towards science and Norby (2003) stated that attitude points were higher in favour of female students (Cited in Freedman, 2001). In a study performed by Karaer (2004), it was concluded that there existed a significant difference between male and female students' answers to the attitude scales.

Answers that students studying at different grades gave to the Science and Technology Lesson Attitude Scale differ from each other. The reason for this could be individual differences, students' having weak attitudes towards the lesson, family structure, socioeconomic level and environmental factors. The greatest responsibility for increasing the points in this attitude scale falls to teachers and the family. That teachers exhibit positive attitudes towards Science and Technology in the lessons may increase students' interest in and attitudes towards this lesson. Similarly, scientific developments that are related to that time could be discussed within the family.

When all the students were considered, no significant difference between attitude points and gender was detected. These results may indicate that in our society, the interest in science exists regardless of gender differences.

According to the results of the interviews with the students, students' relating Science and Technology lesson to everday life indicates that it is possible to transfer what is learned at school tor ela life outside. Results also show that during the lessons, teachers should make use of humour while teaching, respect students' ideas and make the lessons more fun in order to make the learning process more productive for the students. Similarly, the results reveal that students would like to have a more enjoyable learning process which will in turn lead to a more positive teacher-student relationship so as to have more effective and productive lessons. Teachers should also let their students' be more active in the lessons and express themselves better while teaching (Norby, 2003). Because teachers' attitudes in the lessons influence students' attitudes, teachers should seem more interested in the process during science lessons and reflect this upon their students (Norby, 2003).

Teachers should not implement their lessons based on only mathematical operations or rote learning; rather, they ought to employ a mothod which addresses the mind and logic and which is easily comprehensible. During the interviews, some of the participants stated that in science lessons they only liked the parts that required memorization (based on verbal skills). However, teachers should be aware of this fact and perform their lessons by concretizing the subjects or concepts. Students can gain positive attitudes towards science not only at school but also in their social environment and family environment (Shymansky, Yore, Anderson, 2000). During these interactions, examples about current science subjects can be given and their causes and results could be discussed.

Written and visual materials could be used in order to increase students' positive attitudes towards science and technlogy and direct their interests towards science. One of the participants expressed during the interviews that his/her teacher made use of computers while doing the lesson and in this way, his/ her learning became more permanent. Similarly, meaningful learning can be enabled by using scientific models and materials and making what students learn more permanent.

A science lesson which is based on experiments and observations might increase students' interest in the lesson and thus make students like science lessons and enable them to develop positive attitudes towards them.

Learning environment should also be altered depending on the subject that is learned; when necessary, lessons should be held in labaratories or in nature. A cooperative learning environment could be created by getting the students to form groups during the activities. Activities based on experiments and practice should be planned and students should be involved in this process (Norby, 2002). In this way, students' participation in the lesson and their attitudes towards the lesson could be improved in a positive way. However, it should be noted that communication with the students during these activities should be established in a way that is suitable for the students' cognitive levels and it should not lead to a situation i which students' cognitive burden will be increased. Teachers ought to teach their lessons with a language that matches students' cognitive levels (Shymansky, Yore, Anderson, 2000).

Noise, which is one of the factors that hinder the communication in the class, and too big class sizes have a negative effect on students' attitudes (Nair & Fisher, 1999). Results that were obtained from the interviews show that students complain about negative classroom environment. It seems that jokes which are told to make the lesson more enjoyable cause disruption of the lesson and initiation of two-people conversations in the classroom. Humour could lead to unwanted consequences in the class while it can also have positive effects on learning. Similarly, big class size has a negative influence on students' attitudes. When students were asked about their dream science lesson, they mentioned a class in which there were a small number of students.

In order for students to be able to develop positive atttitudes towards science, appropriate visual materials (documantaries, animations, scientific models) should be used in schools, family and other socio-cultural environments, and students ought to be directed towards popular science periodicals. In this way, students will turn into individuals who can question, research, observe and experiment, and who know what scientific and technological developments mean and how they ocur by being more aware of the existing scientific and technological events.

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